Sample File
DEC 1960
ENGINEERING LIBRARY
UA 23 A1 G35 Vol. 2 no. 4

The General Electric Defense Quarterly

Volume II • Number 4 • October-December, 1959

In this issue:

THE NEXT TEN YEARS

- Lester B. Pearson
- Dr. T. Keith Glennan
- Dr. George L. Haller
- James H. Doolittle
- Vice Admiral John T. Hayward
- Lieutenant General Arthur G. Trudeau
- Lieutenant General Roscoe C. Wilson
- Malcolm Muir, Sr.

Table of Contents

The Next Decade in World Affairs
by Lester B. Pearson, Nobel Peace Prize Winner 4
A leading statesman views the broad economic, military and political implications of the future.

Space . . . the Realities
by Dr. T. Keith Glennan, Administrator, NASA 10
Where America actually stands in the race for space.

Industry's Role in Defense Planning
by Dr. George L. Haller, Vice President and General Manager, Defense Electronics Division, General Electric Co. .. 13
An industry spokesman calls for public understanding and support of necessary defense planning.

Soviet Russia Today and the Challenge of Tomorrow
by James H. Doolittle, Chairman of the Board, Space Technology Laboratories, Inc. 18
A special report on General Doolittle's recent tour of the USSR.

The Navy of 1960–1970
by Vice Admiral John T. Hayward, Deputy Chief of Naval Operations for Development, U.S. Navy 26
A forecast of changing requirements to meet an unchanging mission—control of the seas.

The Pattern of the Future Army
by Lieutenant General Arthur G. Trudeau, Chief of Research and Development, Department of the Army 29
The Army's mission during a decade of anticipated international tension.

The Technical Explosion in Military Research and Development
by Lieutenant General Roscoe C. Wilson, Deputy Chief of Staff for Development, U.S. Air Force 33
How mushrooming technology will affect U.S. aerospace capability.

America's Next Ten Years
by Malcolm Muir, Sr., Editor-in-Chief, NEWSWEEK Magazine 36
What the U.S. will face, economically, socially and politically, in the challenge of the coming decade.

THE GENERAL ELECTRIC DEFENSE QUARTERLY

Ralph J. Cordiner, Chairman of the Board
Robert Paxton, President
C. W. LaPierre, Vice President and Group Executive, Electronic, Atomic & Defense Systems Group,
Ray H. Luebbe, Secretary
570 Lexington Ave., New York, N. Y.
John D. Lockton, Treasurer, 1 River Road, Schenectady, N. Y.
George L. Haller, Vice President and General Manager, Defense Electronics Division, Electronics Park, Syracuse, N. Y.

PUBLISHED BY
GENERAL ELECTRIC
SCHENECTADY, N. Y.

CHAIRMAN EDITORIAL COUNCIL—L. H. Naum
EDITOR—Gene E. Bradley

General Electric believes that great value will flow from the presentation in these pages of thoughtful, stimulating and sometimes controversial points of view. It should be emphasized, however, that the opinions of the authors are their own and do not necessarily represent the views of the General Electric Company.

The Next Ten Years

Facing so many unpredictables, such as what to expect from the Eisenhower-Khrushchev meetings, how can America plan for the next ten years and beyond?

Certainly we yearn for disarmament, and hope that Mr. Khrushchev will back his pronounced yearnings with suitable action. Certainly we hope that Communist Far East military adventures will subside. But with so many variables, how can we fully exploit breakthroughs toward peace while yet planning for sound national defense?

Defense planning is a many-faceted problem, and its very complexity forces us to do the most scientific and integrated job ever attempted in our national career. The infinite variety of the mix—military, economic, political, psychological, ideological—compels us to analyze each element yet relate it to the interdependent whole. And this is a job too big for any single government: it emphatically belongs to individual citizens as never before.

The theme of this DEFENSE QUARTERLY was nominated last year by one of our readers, Mr. Edward M. Fickett of Aeronca Manufacturing Corp., who suggested that we focus on the military aspects of defense planning: "armament from the present until about the year 2000 . . . It would seem to us that such a forecast . . . would have a most challenging impact on the formation of opinion . . ." Mr. Fickett's nomination was seconded by other DEFENSE QUARTERLY readers who, in a recent survey, placed the subject, "The Next Ten Years," at the head of the reader-interest list.

We mention Mr. Fickett and the readership study to make an obvious but important point. In America and under the free enterprise system, the customer is king. His is the right to select or reject the articles and magazines he wants—plus the senators and congressmen, the governors and the president, the administration which will largely determine the scientific and defense programs which the nation shall have in the next decade and beyond.

Progress in science and defense through the next ten years is pinned to public understanding and support, but regrettably this understanding and support have not increased at the same rate as advances in technology or as the scope of the Communist threat. Note how our guest authors, throughout these pages, express an underlying sense of urgency. Lester B. Pearson is just the first: "We talk a lot about the strength of freedom which totalitarian societies do not have. But if the individual, the free individual, doesn't exert that strength . . . it will soon cease to be a source of strength."

The danger is that these deep, urgent appeals may be passed off as platitudes, as were Isaiah's warnings back in the eighth century B.C., when Judah was threatened with destruction at the hands of the Assyrians, and was spared only at the price of total servitude. Then as now, commerce was flourishing, and a threat of international disaster impending. Scholar Roy L. Smith writes: "Aware of titanic events about to occur, and sensing a crack-up of civilization, he preached and no man listened."[1]

True: the American public is awake to the danger itself. We recently saw an Army survey which revealed that 80% of Americans consider national defense our most important problem. But, as is pointed out elsewhere in this issue, *they have not been alerted as to what they can do about it!* They are willingly paying the bill for national defense, in whatever amounts they are told is required, but this is not enough.

Our thesis is that true public understanding of what it takes to win can be achieved only through an increased public-affairs effort conducted personally by each of us immediately concerned with defense. Consider the good that could be accomplished if, for example, each DEFENSE QUARTERLY reader would make one address to one important civic or professional group once a year; these 15,000 messages —specific, constructive, straightforward— could stimulate a trend of increased understanding and support that no dogma-ridden dictator could duplicate.

This thesis is unique only in that it has never been fully tried. General Edwin W. Rawlings, former USAF Air Materiel Commander, proposed this basic approach just before his retirement last Spring. His conviction was that the public simply cannot delegate its defense responsibilities in toto to the government-industry-science team; and that it is squarely up to the team members to inform the public of what is required of individual citizens in the business of survival.

[1] *"The Bible and the First World State," p. 45.*

Wide World

The Next L

Will you please evaluate the Eisenhower-Khrushchev talks: what can we expect from them?

Mr. Khrushchev has come and gone. His visit has been more successful than might have been expected.

Those who arranged it must be breathing more easily because diplomacy at the Summit, preceded by a tour which had some of the earmarks of a circus, can be a very risky business. Nevertheless there are signs that the visit and the talks with the President have removed some misunderstandings and reduced tensions. It would be foolish to expect more; and even these expectations must be qualified by what happens when diplomatic negotiations now begin on specific problems, such as Berlin.

The final assessment of this visit will therefore depend on:

1. The progress made in these negotiations, especially on disarmament, where Mr. Khrushchev seems to have made significant concessions to the Western point of view on international inspection and control. It is important to respond to this move quickly and positively.
2. The impression Mr. Khrushchev has received, not only of United States strength but of the sources and non-aggressive

In October, 1955, the London SUNDAY TIMES marveled, "Was there ever an elder statesman named Mike?" That newspaper voiced a fear that the warm personality that earned Lester B. Pearson his nickname might "actually hold him back from the highest ranks of reputation."

In 1957 a five-man board elected by the Norwegian Parliament answered the TIMES' question. Their award of a Nobel Peace Prize to "Mike" Pearson proved that the genial Canadian had entered the inner circle of world statesmanship.

Lester B. Pearson, 62-year-old son of a Methodist minister, has left a distinguished mark on world affairs. He has been called a "front and back room troubleshooter" at the UN, as well as a "most vehement advocate of the Atlantic community."

A former college athlete, stockyard worker, history professor and career civil servant, Mr. Pearson was 51 when he turned to politics. He has served as Canada's Foreign Minister and as a Liberal member of Parliament.

Mr. Pearson has witnessed and helped direct many of the decisive moments in world affairs. He was present at the League of Nations in Geneva, and he spoke out vigorously in London against pre-World War II appeasement policy. He served as Canadian Minister and Ambassador in Washington, attended the Dumbarton Oaks conference in 1944, and was influential at the formation of both the UN and NATO.

Thus, Mr. Pearson's observations about the future are based on a remarkable background of service to his own country as well as prominence in international affairs. His own summary of the importance of the next ten years is, "The goal still remains the ending of war before it ends us."

Politics, economics, and military
strength as factors in
international relations during . . .

t Decade in World Affairs

by Lester B. Pearson, Nobel Prize Winner, 1957

character of that strength. Mr. Khrushchev's talk to his own people in Moscow suggests that these impressions have been good. If so, one of the greatest threats to peace may have been reduced—Soviet ignorance, which is a basic cause of fear and conflict.

In a word, there is cause for some relief and satisfaction in this visit but no grounds for any premature judgment that the cold war has ended. The road ahead is still difficult and progress will be slow. There is at least more hope now that that progress will take place.

What concrete hope does the next decade hold for ending the cold war satisfactorily?

I think there is hope for making progress in that direction. But I assume one or two things. One is that we in the Atlantic area will remain strong. Another is that we will remain united, because I don't see how we can be strong unless we are united.

It's on the basis of that strength and unity that I get my hope. Strength is absolutely essential, not only as a foundation for negotiation, but also because, without strength, any who might wish to break the peace would be almost irresistibly tempted to seek easy victory. So, with strength and with unity, I think there is some reason to hope.

Another reason for hope is not easy to put into words, but I have very definitely the feeling that there are forces at work inside the Soviet Union which will make for greater freedom there as time goes on*. With greater freedom there is a greater chance for cooperation between the Soviet Union and other peoples. I believe that the forces of freedom will never be permanently denied in any society and that they are at work in Russia. I think we can take some hope from that, but I don't think we should allow it to prejudice our strength.

I get hope also out of a possibility of a firm and constructive diplomacy from our side. This is based on the assumption that the Russians are willing to continue negotiation.

Whether these hopes will be realized in ten years is anybody's guess. It means Russia moving toward a mixed society where now there is very little freedom. But on our side, there is a similar trend toward a mixed society, with the state securing more and more power against the individual. Personally I dislike that trend, but perhaps the two societies can more easily meet on that ground of the mixed society where there will be basic freedoms in each.

The danger on our side is that the mixed society is becoming unbalanced in favor of the State. The danger to the present Russian system is the reverse; that forces of freedom will move in the Communist society to the point that they are going to be more powerful eventually than the State is now. This danger is our opportunity. Our danger, they might argue, is their opportunity. That's what Khrushchev undoubtedly means when he says "your grandchildren will all be members of a Socialist society."

Will our present machinery for containing the Communist threat—United Nations, NATO, SEATO, etc.—be adequate for the coming ten years?

Containment is a defensive, a negative concept; it is not enough. We've got to move forward—not merely to contain the Communists but to capture the Communist mind. We've got to convince these people that our system has more to offer the individual than theirs has. That's something beyond containment.

The United Nations as it is at present constituted is of no great value for security purposes. I can't think of the United Nations at the present time in terms of universal collective security because it's divided by the cold war. For this reason you can't use the United Nations now for the security purpose we're discussing without breaking it up. However the United Nations *is* of extreme value as a forum for discussion and negotiation and for increasing the standard of living of backward people.

*See General Doolittle's article on Russia, also in this issue—Editor

"What our deterrent power has done is to give us out some better arrangements

In that sense it remains as important as we hoped it would be in 1945.

While the UN may be deficient in this security area, NATO is here of vital importance. Indeed NATO is the result of our inability to do these things through the United Nations. It's a second best, but it *does* represent collective action for security; something which we never had before 1939. It represents the acceptance of collective obligations for defense by all its members.

If NATO does not develop into something more than a military alliance, it won't last any longer than the fear which gave it birth. There must be some basis for unity and cooperation other than a common fear. This may ultimately require building up the Atlantic community into something almost like a federation of states. If we can't do that, one of these days NATO will fall apart. So we should build up the habit of consultation and cooperation until we get to a point where we are working closely together for far more than defense. This is going to take quite a long time, but the trend, I hope, is in that direction.

Do you feel that we can move in this direction fast enough so that there will be no war?

I don't know. I think that at the present time the greatest protection against war is the fact that both sides now realize that nuclear war is universal destruction; so as long as the western side—particularly the United States—can keep the deterrent at a level where it could destroy the Soviet Union in defense against Soviet attack, then that country is not likely to start any major trouble; or at least commit any major aggression. So we have that protection against war. But in the long run arms alone have never guaranteed peace in the past, and arms alone will never guarantee peace in the future. What our deterrent power has done is to give us an opportunity to work out some better arrangements to secure peace. And we had better do it in the next five to ten years.

What are the next decade's potential trouble spots? How may we anticipate these difficulties? Can we avoid further brush-fire conflicts—total war?

The major danger spot, it seems to me, is the power and might of an aggressive ideology like that of Russia. That's a basic danger. There is no doubt, in my mind at least, that the Russian people are a dynamic, aggressive people; aggressive not necessarily in the military sense, but a people on the march. Look at what they have done in 10 or 15 years! And if that dynamism, that power and might are harnessed to the wrong purpose, it becomes a major danger to peace.

I think the Russian people are genuinely frightened of the United States. So would I be if I were a Russian, because I wouldn't have any other information than that which I got from my government about the United States and its policies. While it is important for us to learn something about Russia, it is much more important that the Russians learn something about us. The more Russians we can get over here for that purpose the better it is.

Do you feel that, with its present attitude, Russia would provoke another Korea, as in Formosa or the Near East?

I think that as long as they feel that they are surrounded by unfriendly powers, particularly the United States, and as long as they feel that we do not accept the specific purposes of international Communism, the Russians will do their best to strengthen their position by creating positions of strength around their periphery. If that means stirring up trouble, they will stir up trouble. But I think—and I hope I'm right—that they are realistic and cold-blooded enough about this in the Kremlin to refrain from going too far. I think they will not shrink from conflict if it strengthens their position, but I don't think they want nuclear war. This is our danger. Not so much that they may start a calculated major war of aggression, but that they may miscalculate and think it's safe to stir up trouble in some area; trouble which might get out of hand.

Many people have predicted that the Chinese threat would gain and the Russian threat would go down in the next 10 or 25 years. Do you think that possible?

Yes. The Chinese revolution is still in a dynamic stage. The Russian Communist revolution has settled down now more into established power politics. I don't think their dynamism has run out; I think they still have it. But the Russians have now established themselves. In consequence, they are probably a little more stable now than they were 20 years ago.

The Chinese Communists, on the other hand, are still in the full flow of revolutionary ardor. They feel that they haven't completed their revolution in their own country; that they haven't yet unified their own country. Therefore they may perhaps be a little more dan-

an opportunity to work to secure peace."

gerous in that respect than the Russians. Furthermore, if and when the Chinese Communists have industrialized their country, the prospect of 500 or 600 million Chinese, industrialized, organized and on the move is pretty frightening. A comforting feature is that perhaps by that time the forces of division between Russia and China will have begun really to operate.

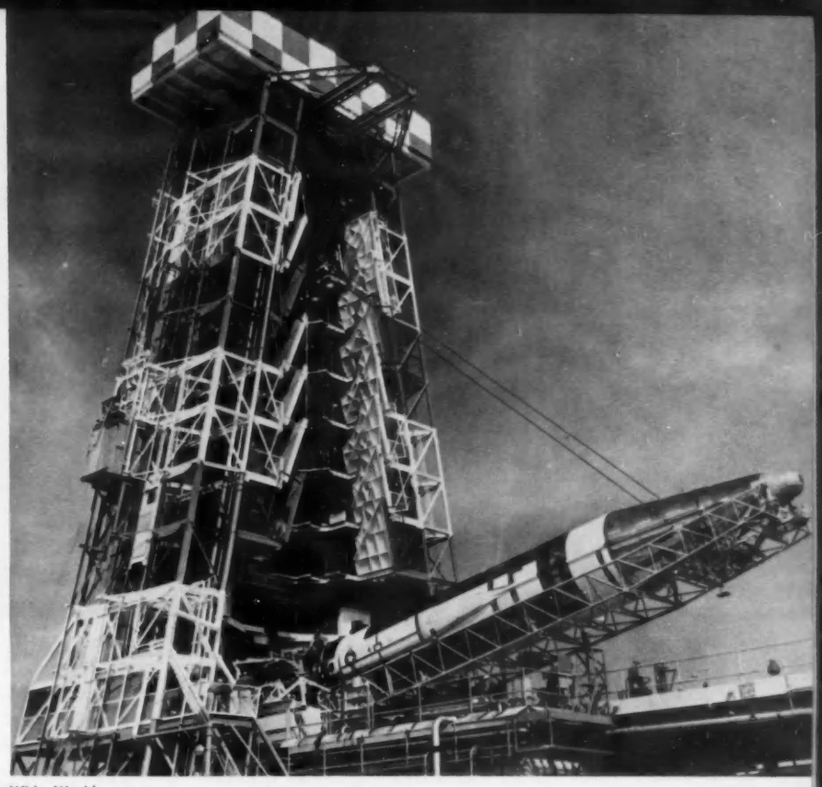
Is there any sort of inconsistency in trying to convince the Russian people that our motives are good when it's just a few people in the Kremlin who make the decisions? Shouldn't Khrushchev really know what our ideals and goals and ambitions are so that he couldn't miscalculate?

He should, but he's the product of a Marxist education and a Communist upbringing. In his younger and more formative days he was subjected only to those influences, so it's possible that he may have become the victim of his own background and his own propaganda. On the other hand, it may well be that he knows that he exaggerates to his own people fear of the United States. That's a well-known tactic of despots, to strengthen your position at home by making your people frightened of something outside.

Now I don't know whether Khrushchev, in his statements about the United States "war mongers" and the things he says about United States imperialism, is being completely dishonest and hypocritical, or whether he has convinced himself that that menace does exist. I once spent some hours with him at his country place in the Crimea, and he can make a very convincing case for his own beliefs and his own fears. However, whether these fears are genuine, or partly genuine and partly calculated, the fact remains that he and his little group—but especially Khrushchev—are the people you have to work on first.

What do you think his objectives are during the next ten years?

I believe we should do him the courtesy of believing what he says in these matters. We didn't do that with Hitler, to our sorrow. We thought that Hitler was merely raving when he made some of his wilder statements about the future of Naziism and what it meant to the world. So I think we had better believe Khrushchev when he says that he is going to make Russia the strongest power in the world, militarily and economically, and thus convince the rest of the world, especially the submerged people of Asia and Africa, that the doctrine under which Russia became so strong so quickly is the doctrine under which other peoples can and will grow strong.

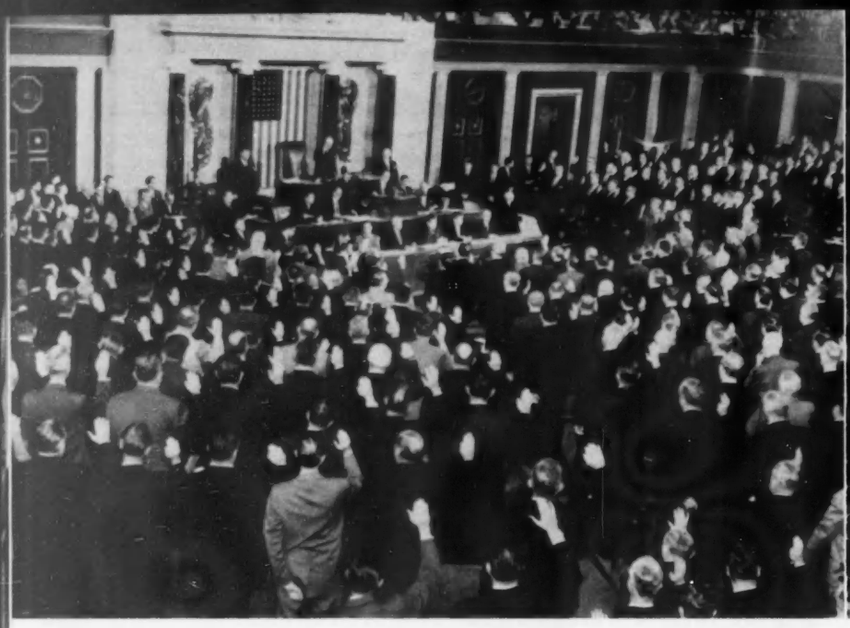


Wide World

" . . . arms alone have never guaranteed peace in the past and arms alone will never guarantee peace in the future."

Do you think he has a good opportunity for winning these uncommitted people?

He has had a good opportunity. I don't think we should be surprised at the progress the Communists have made in the Asian and African territories. I think it would be surprising if they hadn't made such progress. On the other hand, I think we can take some comfort out of the fact that they haven't been able to accomplish more than they have done. These ex-colonial peoples, who considered themselves to have been oppressed and exploited for many years have now found an opportunity to express themselves, and to gain national freedom, in part because of the weakness of the West after two world wars. The Russians and the Communists then moved in and offered them every kind of promise, catered to every kind of desire, tried to convince them that all their hopes could be realized in Communism. They portrayed themselves to these people as the liberators of the exploited and oppressed, and pointed to their own example of what Communism had done for people in Russia, without having to be too particular about the true facts which were not known to those to whom the appeal was being directed. With all that, perhaps it's surprising that the Communists haven't made more headway in Asia and Africa. Although China has gone Communist, there is no other Asian country that has established its independence on the basis of Communist doctrine.



Wide World

Democratic institutions, such as U.S. Congress, must set a world-wide governmental example.

Wide World

All forms of governments around the world face the pressure of new social conditions.

". . . we must become educated in our own obligations of the community of nations,

How do you feel the lineup of nations in the Near East and in India will be ten years from now?

I wouldn't be a bit surprised that, if I went to the United Nations Assembly ten years from now, I would find that the non-Communist Asian countries have formed a pretty solid and pretty powerful group; that the Middle East and African countries would also, by that time, have formed important blocs, and that these blocs would be quite as jealous of Russian Communist interference as of Western interference.

I think that as countries become established as independent states, they will realize that Communism is a new form of imperialism, of greater menace to their independence than the old-fashioned imperialism which is on the way out. I think there is evidence now in the Middle East and in Asia, and indeed in Africa, that these new countries do not wish to have the old form of imperialism replaced by the new form of Communist imperialism.

We have allowed the Russians to pose as the defenders of people struggling to be free against imperialism. It has not been easy to prevent them from doing that. These countries have no experience or knowledge of Russian government or methods, but they do have knowledge and experience of British, French, and Dutch government, and some of them didn't like it. As a result, they fall for Russian propaganda; especially as the Russians give strong verbal support to all their nationalist demands.

Somehow or other we have to get across—or they have to find out for themselves—that the Soviet Union represents this new and dangerous form of imperialism.

They are beginning to find it out. Hungary drove it home to them. Events in Tibet made quite an impression on Asian countries. By the same token, the British, for instance, don't mean imperialism to them now. In fact, the British have shown them the way to freedom. No one is frightened in Asia now of British imperialism in the way they used to be. I think that the Chinese tyranny in Tibet earlier this year and the quelling of the Hungarian revolution by Russian tanks did far more to destroy the influence of Soviet communism in Asia than any amount of propaganda from the West.

What do you consider to be the challenges and relationships required of the individual members of the Free World defense team—individual governments, private companies, and the citizens, share owners, and employees supporting each?

When I hear a question like that, I despair of my own ability to answer it in any satisfactory way, because what you have said is: What must we do to be saved? I wish I knew the answer. On the level of government, is it not true that any free and democratic government has now to think of its own policies in a context wider than its own boundaries?

There is going to be a need for a great deal of tolerance and understanding on the part of legislatures and governments. And that means we must become educated in our own societies to the obligations of the community of nations, of humanity. Democratic governments won't often do what is needed unless their own public opinion makes it possible.

World

Sovfoto

Even totalitarian states will be forced to recognize and meet these changing conditions.

societies to the
of humanity."

In relation to individual private companies that are today supplying products of both defense and peace, do you feel that there is an increasing responsibility that the individuals in those companies have—the share owners and the employees?

Yes, I certainly do. I think that any company now has obligations to the community and to the country apart from its obligations to its shareholders. And that means that the problems now are not merely problems of production and profit, they are problems of social relationships both inside a corporation and out.

One of those problems, of course, concerns the company's internal workings, its employer-employee relations. It seems to me the same principles apply there and that the problem is one of social and economic adjustment inside the corporation so that all the workmen—and that includes the president—feel that there is justice and fair treatment. If you can get that kind of relationship inside a corporation, you're half-way to the goal of a good relationship between the corporation and the state.

I think most organizations, whether corporation organizations or union organizations, are now beginning to accept their social and political responsibilities. There are some notable exceptions perhaps, but I think we're making progress. One way in which we can show that progress is through the acceptance of political obligations by individuals inside organizations. And one way to do that is to take on any political or public service job which is in your reach or capacity.

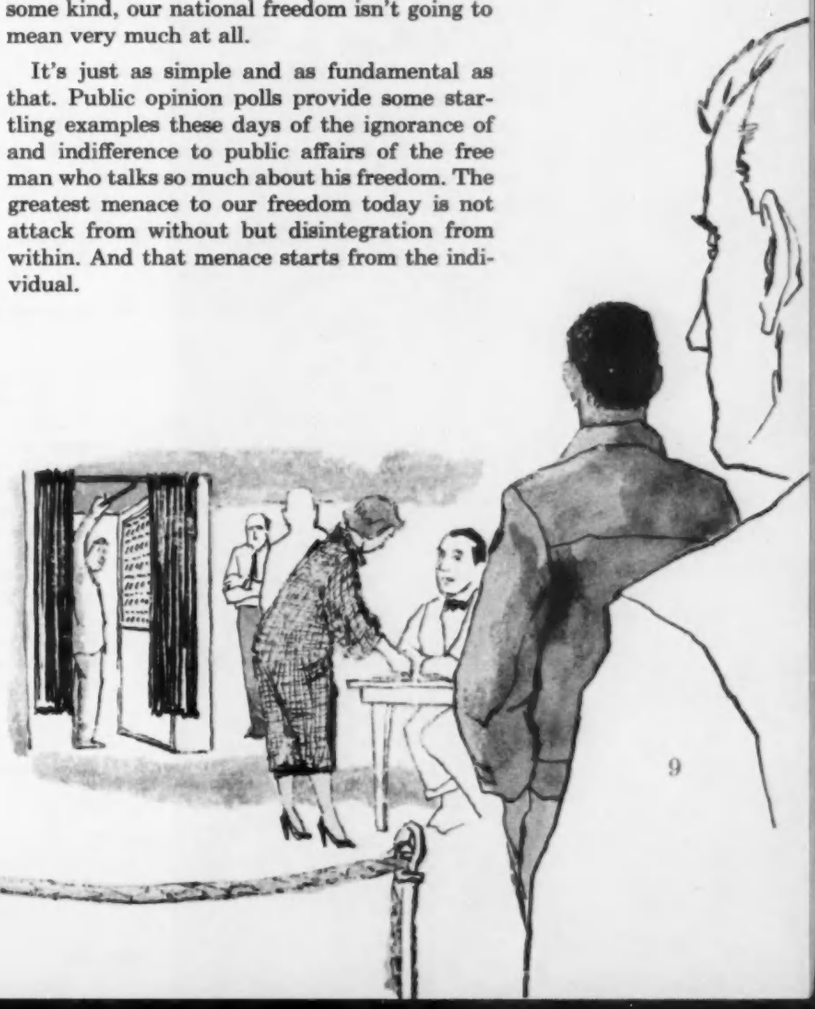
What can the individual do to make his thoughts and his actions felt in this extremely complex world of politics, geopolitics, military life?

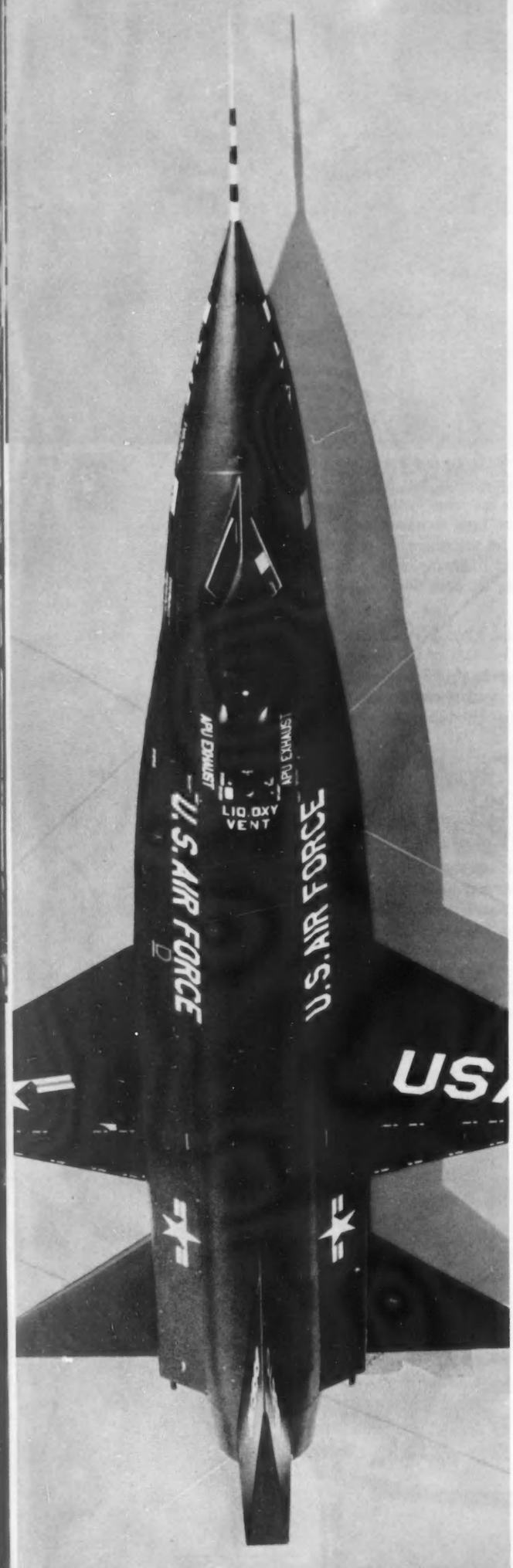
Of course it all gets down to the individual in our kind of free society. He is the base of the pyramid, and if the free individual is not strong, then the democratic society cannot be strong. We talk a lot about the strength of freedom which totalitarian societies do not have. But if the individual, the free individual, doesn't exert that strength, doesn't use his freedom in the right way, it will soon cease to be a source of strength.

Every individual in a free society has an obligation to that society. It doesn't necessarily mean that he has to go out and try to get into Congress or government, but it does mean that he has to make his own judgments on public questions, and he's got to base those judgments on intelligence, on tolerance, on accurate information. He's got to throw aside prejudice and narrow self-interest, and that's not very easy to do.

When people ask me: "What can I do—I'm worried about the state of the world—what can I do?" I tell them to study public affairs so they can make their own decisions on the basis of knowledge, not on the basis of prejudice or pure partisanship. I tell them to take an interest in their own community affairs—that's where it all starts. Unless we live up to our own values and express those values in public service of some kind, our national freedom isn't going to mean very much at all.

It's just as simple and as fundamental as that. Public opinion polls provide some startling examples these days of the ignorance of and indifference to public affairs of the free man who talks so much about his freedom. The greatest menace to our freedom today is not attack from without but disintegration from within. And that menace starts from the individual.





"... it is time we ... inject
and good technical judgment

SPACE
... *the realities*

by Dr. T. Keith Glennan *Administrator*
National Aeronautics and Space Administration

Once upon a time, there were three Princes of Serendip. The princes of this mythical kingdom had a happy facility for finding agreeable situations wherever they looked. From this legend Hugh Walpole coined the word "serendipity." Many of us in the space field have been suffering from serendipity of late.

There seems, in fact, to be a contest in this country, in which substantial numbers of scientists and engineers are attempting to outdo each other in predicting exotic accomplishments in space in the near future. There is much blithe talk about manned expeditions to the Moon, Venus, Mars, and beyond—as though these adventures were well within our present capability.

Much as we need the imaginative suggestions offered on all sides, in my opinion, it is time we work up and inject some common sense and good technical judgment into this picture. One eminent scientist not suffering from serendipity is Dr. Lee DuBridge, President of California Institute of Technology. Dr. DuBridge puts it this way: "We may have conquered 'space'—yet we are still rather like a fly who has reached the outside of the windowpane but who, in a thousand lifetimes, could not begin to explore the next county."

The Birth of NASA

One year ago (October 1, 1958), NASA was born. By absorbing the personnel and facilities of the distinguished National Advisory Committee for Aeronautics, as well as capable scientists from the Vanguard program and from the Naval Research Laboratory, we were able to get a running start on a tough program inherited, in large part, from the military. Yet during the first year of NASA's existence, our experience in the space field has been less than satisfactory. The ratio of successful launches to what has been euphemistically called "suc-

some common sense
into this picture . . . "

cessful failures " has not improved very much during this period. Of 11 NASA-sponsored satellites and space probes between October, 1958 and mid-August, 1959, six have been out-and-out failures, three have been *limited* successes, and two have met, in very substantial measure, the requirements established for them. As soon as we began planning what we call "second generation" experiments, we found that we were facing some hard facts of life in the propulsion and guidance fields.

Probably more than any other single matter, the question that plagues us is one of reliability. When will we be able to count on being successful in launching and placing into orbit, or on the desired trajectory in deep space, as many as three out of four of our experiments? We should admit that with distressingly few exceptions, we have not achieved complete success in our missions to date; success in the sense that the payload has been injected within reasonable limits of the planned flight objectives and in the sense that the payload has performed its mission satisfactorily.

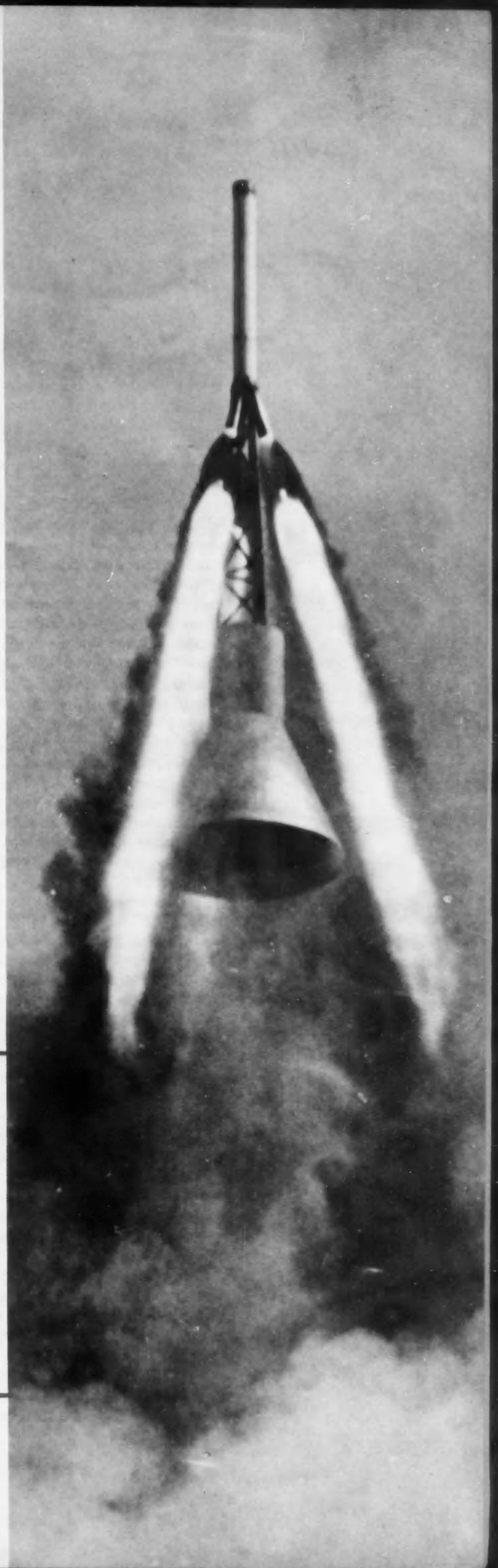
I hasten to point out that the USSR reports only its successful flights. We are virtually certain that they have had failures. And we do not know whether their announced successes have come any closer to the intended objectives than have ours.

Our Future Course

Out of the sobering experience of these past months, our course for the future has become more clear. We have had to face up to the fact that we simply cannot do everything that is proposed either by members of the scientific community, other agencies, or by our own

T. Keith Glennan is the first Administrator of the National Aeronautics and Space Administration. As director of a staff of engineers, scientists and technicians engaged in aerospace research and development, Dr. Glennan reports directly to the President. His experience includes a number of civilian industries, as well as government service with the Navy Underwater Sound Laboratory and as a member of the Atomic Energy Commission.

As President of Case Institute of Technology (he is now on leave from that position) Dr. Glennan proved his ability as administrator and educator. Under his leadership, the Institute became one of the country's top engineering schools.



Wide World

"...major advances in research and development techniques...must be accomplished."

people. Some of the firing schedules we developed nine months ago lacked the realism that now characterizes our planning. And that is as it should be; we should improve our planning with experience.

Thus far we have been engaged primarily in completing experiments planned for the International Geophysical Year. As a matter of fact, Explorer VI, the "paddle wheel" satellite, was the first of the experiments specifically initiated by NASA. Within the next year, our space sciences program will begin to develop in an orderly fashion. In fields such as astronomy, meteorology and the physical sciences, interesting and challenging experiments are in work. Lead times for most of these experiments will be long; they will call for continuing high levels of effort and support. Unless we can achieve this goal—unless we warrant and are given sustained support—we will lack, ultimately, the underpinning for the entire space program and may miss the really important discoveries that now lie hidden from our view.

We plan to concentrate our initial efforts in deep space on lunar missions—near miss, orbiting, and "hard" and "soft" landings of payloads. Through these activities, we will develop the techniques necessary to accomplish missions into deeper space and will use them for such missions as their reliability and the opportunity permits.

Basic Research and Advanced Technology

As to basic research and advanced technology: we expect to support greater effort in the universities, other non-profit institutions, and in industry in both basic research and advanced development of systems components. In the development of better methods and devices in the fields of guidance, control, telemetry, auxiliary power units and sensors of all types—in all of these areas, we see the need for greater concentration of effort. Through such actions we hope to improve the reliability of the systems which will employ these components.

As to booster systems: it is becoming increasingly apparent that greater efforts must be placed on simplification and reliability. As a corollary, it seems quite clear that continued attention must be given to a reduction in the number and varieties of rockets and rocket booster systems for use in the space business. It is unlikely that these systems will become off-the-shelf production items in the foreseeable future. With limited numbers of firings in prospect, reliability can be expected only if the variety of systems is kept at a minimum. It will be cheaper to waste payload space in using an oversize booster that becomes reliable through continued use than to tailor boosters for each specific mission with the attendant lowered reliability that surely will result from infrequent use.

As we move ahead in our program, using newly developed vehicles of larger size and with more stages, the problems of achieving successful flights will increase. Recognizing the statistical success thus far achieved with the single- and two-stage missiles and the number of firings required in their development period, we must ask the questions as to the probable success of a seven-stage vehicle required to land a man on the Moon and return him to Earth. Clearly, major advances in research and development techniques leading to greater vehicle reliability must be accomplished. Both the cost and development time will be prohibitive if vehicle development depends, as it does now, so heavily on "trial by fire." As a part of our program, we are currently studying methods for development that might lead to earlier success of our flight vehicles, and the progress we make here may well determine how long it will take to carry out the advanced missions that we are all so anxious to accomplish.

New Materials Research

Finally, as in most other advanced technologies, a vast new area of materials research is being opened up by our space exploration requirements. Many materials exhibit different properties when used in radiation fields and in the vacuum of space. These materials must be improved or other materials found or developed to replace them. Magnesium, for example, sublimes in a vacuum—and effectively disappears. Another phenomenon: two moving metal surfaces in a vacuum tend to weld together by molecular adhesion. Our engineers and scientists are facing many such problems, but the list is far too long to catalogue here.

Such are the realities as we face 1960. These realities have neither dimmed my initial enthusiasm nor made a defeatist out of me. On the contrary, my colleagues and I are even more eager now than we were a year ago. As the challenges and opportunities open before us, I am reminded of a statement made once by the late Dr. Robert H. Goddard, father of American rocketry, which went like this—"It is difficult to say what is impossible, for the dream of yesterday is the hope of today and the reality of tomorrow."

Dr. George L. Haller is responsible for the development and production of an important selection of the nation's military electronic equipment.

As a Vice President of the General Electric Company and General Manager of the Company's Defense Electronics Division, Dr. Haller heads facilities which develop and produce a varied array of equipment ranging from reentry vehicles to early warning radar, from missile guidance and fire control to electronic motor locators.

Dr. Haller's experience dates almost from the start of electronics as a major military science. From 1935 to 1942, he was a War Department radio technician, following electronics training in both private industry and Pennsylvania State University. On active duty with the Signal Corps during World War II, he received the Legion of Merit for development of the Air Corps radar countermeasures program. He has headed General Electric's Defense Electronics Division since 1956.

INDUSTRY'S ROLE IN DEFENSE PLANNING

by Dr. George L. Haller, Vice President and General Manager
Defense Electronics Division, General Electric Co.

" . . . it is no longer sufficient for companies merely to stand ready to satisfy military requirements. Industry must now work jointly with the Department of Defense in decade-spanning planning."

Let me state at once and very directly the thesis of this article; namely, that industry's role in defense planning has changed drastically during the past decade, that it must undergo an equally revolutionary change during the next decade, and that such changes cannot progress without greatly increased public understanding and support.

Support is essential, but we cannot expect it without understanding. The American public understands that modern weapons and defensive measures are expensive, and has demonstrated willingness to take the necessary steps for the national protection through support of our defense team's large annual budgets.

Thus the public has indicated its willingness to do whatever it takes to win in the struggle for security and survival. It is equally important that they understand the conditions for survival, as the basis for the kind of public support that can only make our defense efforts fully effective.

For example, it is no longer sufficient for companies merely to stand ready to satisfy military requirements. Industry must now work jointly with the Department of Defense in the decade-spanning planning.

Government-Industry Relationship

Private industry, under our competitive enterprise system, must work hand-in-hand with the Department of Defense, if the military is to have the technologies and products required to meet national objectives. Yet there are still many people who would prefer a cold, arm's-length relationship with ever more elaborate machinery to prevent improprieties and mistakes. Such machinery may prevent some mistakes, and conceal others, but the overelaboration of safeguards where technological innovation is involved can expose us to a much more critical danger—loss of lead time.

The military fully realizes that it cannot define intricate new requirements and expect industry to produce, overnight, the hardware required to satisfy those requirements. The Department of Defense knows that industry

"There are two kinds of defense progress: e

today must be planning, researching, and developing new technologies actually in advance of the military requirements for them. Our military know that Soviet military-industry progress achieved through compulsion must be more than matched by even greater U.S. progress achieved through the full utilization of the superior capabilities of private industry and the basic advantage of the free competitive enterprise system. This is the key to reducing lead time and preventing future gaps in the relative strengths of aggressive Communism and the Free World.

Our military leaders know this. Industry knows it also—and is providing the necessary teamwork of effort. And the public—once the facts have been plainly stated to the American people and are known—will support the industry-military team in doing what has to be done.

General White's Statement

Three and a half years ago, at the opening of General Electric's new flight propulsion facilities at our Cincinnati plant, Air Force Chief of Staff General Thomas D. White (then vice chief) said: "We must realize that the defense of this nation is everybody's business, not just our own government's. That is both the price and privilege of democracy. The products of American capitalism, our great corporations, must accept, along with their comparative freedom of action, their share of our national responsibility to provide our own defense.

"Our great corporations can best volunteer increased efforts to the area of research and development.

"I am speaking specifically of the research and development efforts necessary to keep our weapons superior to weapons in the hands of potential enemies.

"Research, especially basic research, is best accomplished by unfettered initiative working in an environment of complete freedom. Governmental projects are accountable to too many people to operate in a completely free environment."

With the Air Force alone executing contracts for research and development with 250 universities and other nonprofit institutions, plus 1100 industrial concerns, how could it feel otherwise then to expect—to urgently need—great progress from its partners? I am convinced that suspicion and distrust outside the military-industry team are in large part the result of public misunderstanding.

What can we do to clear up this misunderstanding? In an attempt to find the answer, it may well be that the first step is to review the situation in the hope of pinpointing the underlying misconceptions.

There are two kinds of defense progress: evolutionary and revolutionary. We need evolutionary progress to perfect the weapon systems we are now working on that must be in position, on time and in perfect working condition, to deter aggression. We need revolutionary progress to plan those long-range concepts that will be needed in still-undefined weapon systems to satisfy still-undefined defense needs.

Wide World

Conversion of peacetime facilities to defense production is no longer adequate. Modern weapon systems, suc

s: *evolutionary and revolutionary."*

Both routes must be explored simultaneously. Evolutionary progress of itself cannot be expected to yield revolutionary results. Even the dizzy pace of following one technological advance into the next still only yields progress in an arithmetic progression, and it takes a complete breaking away from daily discoveries (and daily operational burdens) to make radical breakthroughs. Automobiles were not achieved, we are told, through further refinements in the horse. Jet engines did not evolve from piston engines.

Thought Must Be Liberated

Experience has shown that real Paul Bunyan strides are possible only when we liberate thought from the burden of daily operation. Truly great progress is possible only through combining the free-wheeling approach of the ivory tower with the maturity, judgment, and self-discipline of the scientific laboratory.

It is American industry's conviction that long-range planning is best carried out in a free-enterprise atmosphere by many competitive, decentralized units. The Communist leaders challenge this concept. They believe, instead, in the highly-centralized programs of the so-called "peoples' democratic republics." True, in centralized planning, great singleness of purpose and expedience are easier to attain, but the possibility of desirable innovations is limited. In decentralized planning, however, while the agreement on common purposes and common strategies is hard to achieve, innovation is emphasized. I think it is clear that a free society possesses the capacity for action, growth, inventiveness, and sheer creativity which no dictatorship, for all its weight and drive, can equal.

The Pattern of Industry's Role

Industry's role in long-range planning is generally considered to fit into the following pattern:

1. It is up to the government—the National Security Council—to define national policy and objectives, including all aspects of national defense;

2. The Department of Defense must plan and deliver the military support needed to help satisfy those national objectives;

3. Private industry must plan and deliver most of the actual military technology and hardware needed by the Department of Defense.

What is not generally recognized is that these three processes must all push forward in parallel. Lack of such coordinated action is a major reason for the great length of time required for the United States to develop a new weapon system. Further, and perhaps more important, new technologies can and should actually help shape policy itself. The atom bomb is simple, dramatic evidence of this point. So is the ballistic missile. If the United States is to enjoy the security that can be realized through being first in still-undreamed-of breakthroughs in technology, public opinion must demand, not just tolerate, better coordinated forward planning by the governmental-military-industry partners, with industry given a free hand to assume more leadership.

tems, **such as BMEWS, are too technical, too complicated and too expensive to produce on such a basis.**

"Public scrutiny must include . . . maximum public information to permit wise scrutiny."

To illustrate how one company can accept its share of responsibility in the task of formal planning (many companies are, of course, also striving for this same objective), let me explain how we at General Electric try to assess the kinds of technologies and products needed through the years ahead and how we try to integrate with the Department of Defense.

Forecasting the Future

In our look at the future, we rely both upon all of the information obtainable from our defense partners and upon research conducted through our Technical Military Planning Operation. This component is directly responsible for pulling into focus the long look at analyzing and forecasting what the likely national security requirements for the United States will be. This difficult task is complicated by such problems to planners as (1) the ever-changing nature of weapon systems—their components, purposes, effectiveness, and rapid obsolescence, and (2) the political commitments and expectations that exist without too much consideration of the military capabilities to fulfill them.

In this activity we are inspired by the conviction that it is obviously industry's role to supply whatever is required, from the smallest component to a complete weapon system. *But the technologies must be made available in advance of the call for the specific product.* What will win the wars of the future—or better still, prevent them from starting in the first place—is no longer the weapon that can be produced in quantity by a quick changeover of industry to a wartime basis. It could well be that what we would need would be not quantity items but a single unit—but a unit so vast, so technical, so complicated, so expensive that it would require resources, our best brains, and considerable time to produce. The BMEWS (Ballistic Missile Early Warning System) is an example of what I mean.

While our Technical Military Planning Operation is exploring the needs for weapon systems, our research laboratories are probing into the technologies that those weapon systems will require. Such research, sometimes criticized as profitless, is immensely important and absolutely fundamental to either military or commercial progress.

Meanwhile, more specific development work is going on in our product departments and their laboratories. In all, there are about 100 such in-company organizations, including flight propulsion and atomic energy. And, most important, General Electric is just one company among literally thousands who are planning, developing, and competing in the intense race and quest for innovation. Can anyone really doubt that such a free-enterprise approach, fully energized and encouraged, can win?

Public Understanding Meager

Yet the present state of public understanding is meager. This deficiency I blame, not on the public, but upon all of us in industry and government who know the true situation. It is we who must assume the burden of responsibility for communicating the new concept of the defense business to the public.

I submit that this problem is specific, immediate, and important. In support I offer the following points:

1. Until the public fully appreciates the vital need for the fullest coordination among military-industry team members, including the best utilization of all available talent in thinking and planning, the effort will be hampered by widespread suspicion of any but the most aloof contact among these members.

2. Until the electorate, and its representatives in Congress, fully comprehend the inevitability of long-haul defense programs, we shall be plagued with the inefficiency and uncertainties of stop-and-go defense financing.

3. Until we create popular awareness of the need for flexibility, decision, and drive in determining the course of defense research and development, we shall be bogged down in a "prevention of mistakes" morass instead of relying on redress controls.

4. Until we as citizens fully recognize that defense contracts must be awarded purely on the basis of national defense, we shall dilute our strength, run up the cost, and invite weakness and aggression through clamoring for special considerations—for the award of contracts on the basis of geographical location, depressed areas, size of contractor, or other political considerations—instead of on the basis of getting the best defense job we can get as inexpensively as possible.

Many observers have pointed out the difficulty—yes, even the danger—of conducting diplomacy or defense in a public arena. But we have, and want, no other choice. Public scrutiny is required to keep out special considerations not germane to the problem. However, the right of public scrutiny must include the necessary corollary of maximum public

One stimulus which leads to successful long-range defense planning is the free-enterprise approach—the intense race for innovation which develops among freely competing companies.

information to permit wise scrutiny. This is not to say that the public can or should enter into the actual decision-making process. These vital decisions must be made at the level at which the maximum strategic and technological information can be brought to bear on the problem, by those who have both the authority and the responsibility. But a wide public understanding of what is involved in the process of creating the new weapons and systems that we don't even know we need yet, in time, and ahead of a determined and technologically competent enemy, is the best guarantee that these decisions will be made at the right place, at the right time, by the right people. Instead of criticizing the system which we know is the answer to the Soviet threat, we need to make it work better through fuller understanding of the issues involved.

Mr. LaPierre's Testimony

Testifying on one aspect of this subject in Washington recently, General Electric Vice President C. W. LaPierre said:

"Testimony before several committees of Congress, including this one, has emphasized the critical importance of lead time in exploiting a new development or idea for the defense of the United States. The importance of lead time in exploiting technological innovation simply cannot be overemphasized.

"It is worth noting here that, in the early stages of the development of an advanced weapon system, we are characteristically dealing with ideas—the new weapon or system exists only as a concept in the minds of the men who are conceiving it—and the worth of new ideas is not always the easiest thing to evaluate. Scientists and engineers themselves are not always the best judges of this. And the development of even the most important idea for defense must be related to specific requirements up to ten years out in the future.

"If the maximum rate of technological progress, upon which so much depends, is to be achieved, there must be a continuous interchange of information between science and industry and the military. The military needs to be continuously aware of the possibilities and capabilities of industry, particularly in research and development, and industry needs to be informed as far as possible about long-range military planning and strategic requirements."*

Mr. LaPierre concluded his statement by urging Congress not to "erect an iron curtain through which ideas and information on scientific and technical possibilities cannot pass from industry on one side to our military experts on the other; and through which the requirements, problems, and long-range plans of the military cannot be brought to the attention and abilities of industrial scientists, engineers, and managerial executives."

I am optimistic that we shall solve our problems, both technological and public. Defense and survival are no longer issues which the citizen can—or really wants to—shrug off with the thought that the government will take care of him. They have, necessarily, become everybody's business. But everybody doesn't know it yet. In our working for peace we must use our total strength—military, economic, and moral. This can only be done through an informed and aroused public consciousness.

*Statement before the Subcommittee for Special Investigations, Armed Services Committee, House of Representatives, Washington, D. C. August 11, 1959.

SOVIET RUSSIA TODAY

and the challenge of t

by James H. Doolittle Chairman of the Board, Space Technology Laboratories

"A mere statistical biography of Jim, even although it embraced the broad variety of his interests as an educator, business executive, airman and soldier, scientist or engineer, would be like a description of Mount McKinley from a surveyor's report," recently smiled one of his old friends. "He's much more than the total of the many remarkable things he's done and all the honors he's had. Few personalities of history have had a mind so catholic in relation to the challenge of the times in which they lived. Yet Jim Doolittle can not be measured in the abstract. He's loftier as a human being than as a scientist, soldier or anything else."

"I've long marveled at Jimmie's physical and intellectual vitality" observed another intimate, "but when I come to examine the source of my devotion to him, I find it focused on his personality. He's one of the gentlest men I've ever known."

Perhaps it is the truest mark of greatness that a life is inextricable from the inspiration of its times. If this indeed be the case, General Doolittle will stand in history as one of the giants of the 20th century. Even beyond his brilliant exploits as an airman, his vision of the potential of the air age will be remarked by the historian. As much as any one individual he has created the climate in which civilization can aspire to the stars.

—Gill Robb Wilson
Publisher, *FLYING* Magazine

# of tomorrow

Editor's Note: Any attempt to forecast the progress of Western Democracy over the next ten years in its race for survival will profit by a look at our competition. Such a look is provided in the following notes (made available in an exclusive feature for *THE DEFENSE QUARTERLY*) by Lt. General James H. (Jimmy) Doolittle on his recent trip to Soviet Russia as a delegate to the annual meeting of the Federation Aeronautique Internationale. General Doolittle also gives his answers to some specific questions inspired by his notes on the USSR.

Russia is in many ways primitive, but she is making rapid progress in those areas to which high priority is given. Priority has been given, more or less in the order shown, to: education, science, the military, heavy industry, power, transportation, housing, farm production, and consumer goods. The following comments are based on conclusions reached as a result of my trip.

Education

Most Russian children go to nursery school

until they are three. Then they go to kindergarten until they are seven. Under the old system, it was obligatory that a child go to school for ten years from the age of 6 to 16 in the metropolitan areas. Now they start at seven and go to primary school for eight years. This is for everybody.

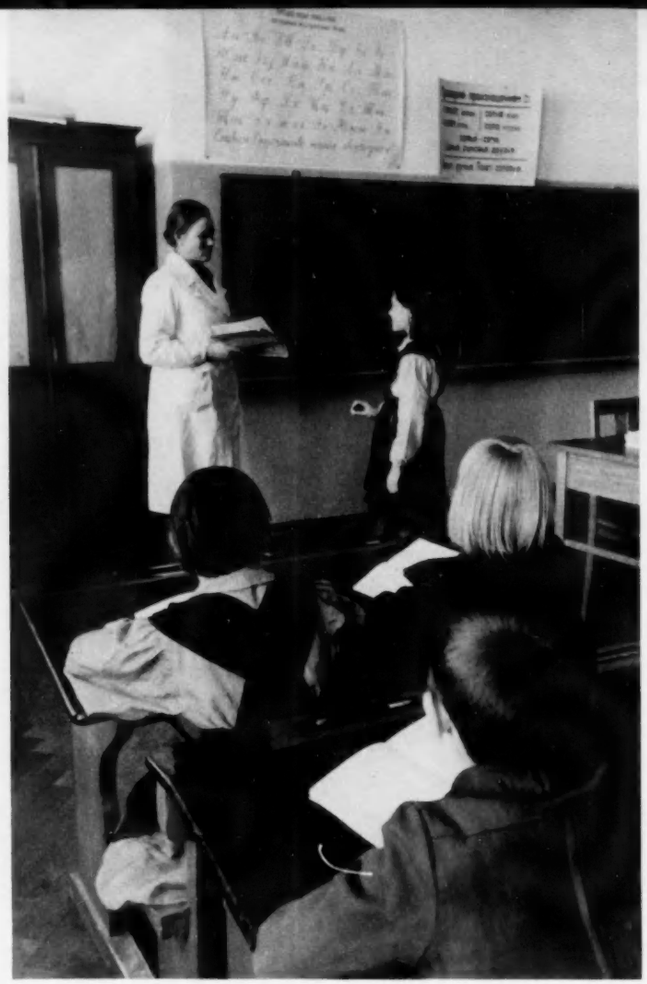
Secondary school is for three years, part study and part productive work. Everyone in the urban areas goes to secondary school.

Originally they wanted to give everyone a college education. It was soon found, however, that this was impractical because of ineptitude on the part of some students and because of shortages of facilities, equipment, and staff. Now full time in college is provided for only the few who are especially gifted intellectually. Appointment to the university is highly competitive, and the teachers' recommendations carry great weight.

Almost from birth the Russian child is subject to extremely effective brainwashing. The thoroughness and almost complete effectiveness of this constant process on the minds of the young, and its later domination of the adult's thinking, is difficult for us, living in a free country, to appreciate.

The only ideology the child is permitted to know favorably is Communism. He is taught that religion is stupid and that capitalism is evil. (While we consider a capitalist to be someone who owns something and uses it, the Russians consider a capitalist to be anyone who profits from the labor of another. In Russia you can hire a servant, if you are able, but you couldn't hire anyone to work on your farm or in a store—if you had one.)

The truly big thing in Russian education is the fact that they have better discipline and that most of their children work much harder to get an education than ours do. Serious effort —hard work—starts when the child enters primary school.



Sovfoto

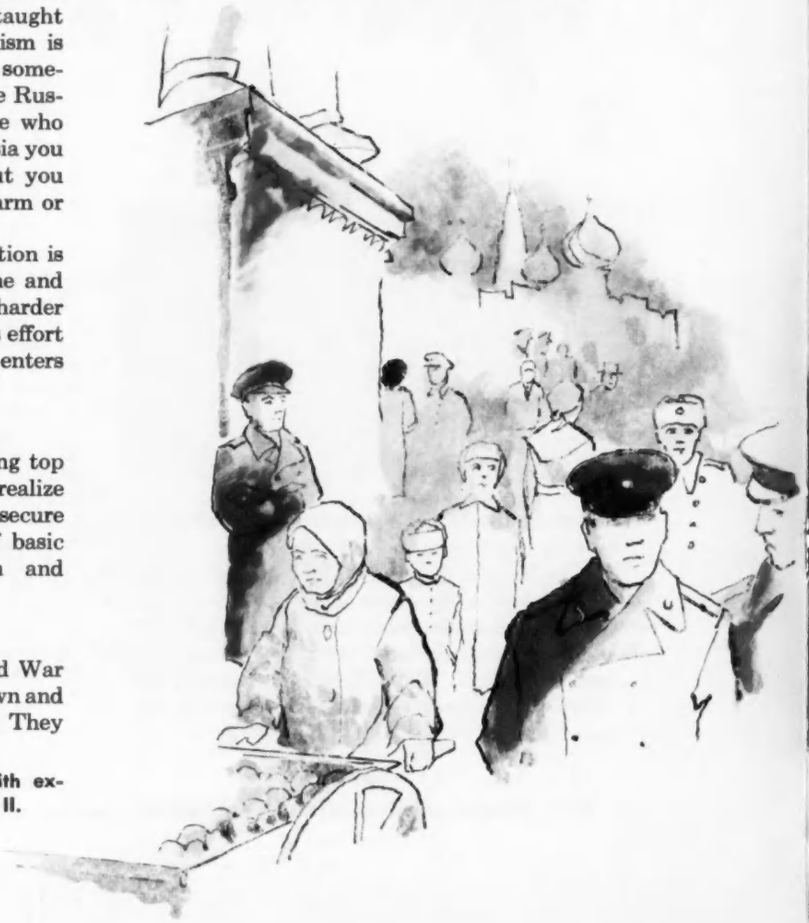
Strict discipline, hard work, and continuous exposure to Communist doctrine characterize the Soviet educational system.

Science

The Russians have given and are giving top priority to science and technology. They realize that their future position in the world is secure only if built on a sound foundation of basic knowledge gained through education and science.

The Military

Russia did not demobilize after World War II to the extent that we did. They cut down and reorganized their land and sea forces. They



Limited demobilization still left Russia with extremely large armed forces after World War II.

emphasized mobility and firepower in the army and long-range submarines in the navy.

Initially they concentrated on air defense—radar, interceptor fighters, and ground-to-air artillery and missiles. Next they started developing their air-offensive capability—manned bombers—and now they are rapidly developing their space-offensive capability—ballistic missiles. It is possible, probably because of technical or economic problems, that they are now concentrating on ballistic missiles to the exclusion of additional manned bombers.

Heavy Industry

High priority has been given to the development of Russian heavy industry. Last year Russia is reported to have passed us in machine tool production. She has something over half our steel production, and her rate of production increase is roughly twice ours.

Power

The Russians are exploiting their tremendous capacity for producing hydroelectric power and are also developing steam power, as well as power from atomic energy. This they know they must have to expand their heavy industry and communications.

Communications

High priority is now being given to improving internal communications—to transportation. The Russians have established good airline coverage over most of the Soviet Union. Many old, conventional planes (piston engines) are still in use, but the more modern airliners are jets and turboprops.

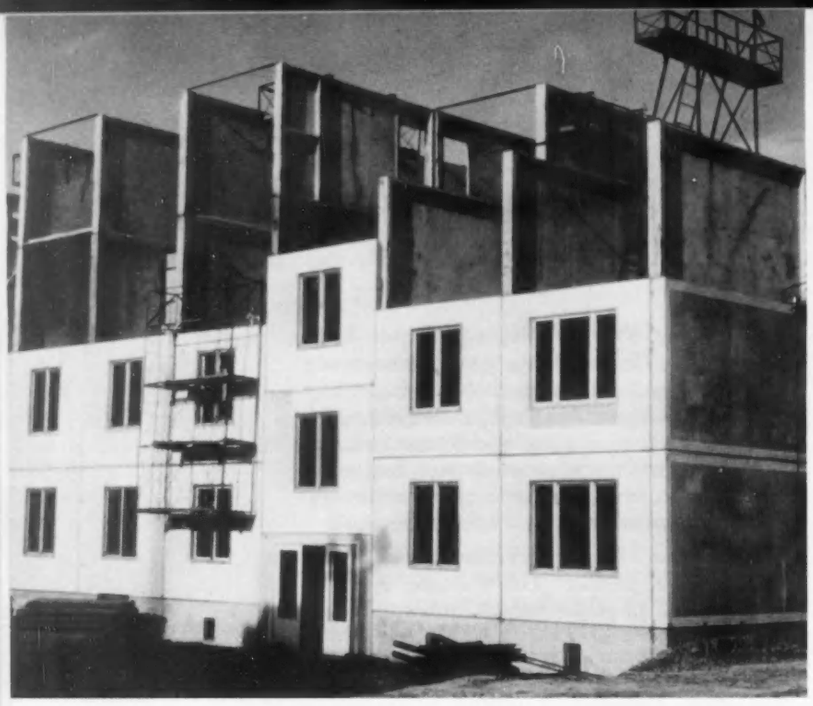
We flew from Moscow to Tbilisi in a TU-104 twin-engine jet airliner. This airliner, though heavy, had a high power-weight ratio and took off quickly (40 seconds). It is not as aerodynamically clean as our jet transports, does not carry the payload, and does not have the range. Range limitation is so critical that the plane is frequently towed to the take-off point to save the fuel that would be used in taxiing. The landing was fast, and the brakes overheated and smoked so badly that the ground crews immediately inspected them.

There is presently in progress a major program of road construction. While the road traffic outside the metropolitan areas is light—and in the back country very light—what traffic there is is made up largely of trucks working on road construction. There is also considerable airport construction going on.

F. C. Crawford

Ornate Moscow subway station shows emphasis on internal communications, transportation.

Development of Union of Soviet Socialist Republic's power potential is high-priority project.



F. C. Crawford

Soviet Union has a vast housing construction program under way to provide apartments like this one.

Primitive methods handicap production on Russian farms. Very few farms are mechanized.

"The Russian people . . . have been told that i
they will be the n

There is still a lot of pick-and-shovel work in road building. Much of the labor is done by husky—and apparently happy—women.

The subways in Moscow and Leningrad are truly Communistic showpieces. They clearly point up what state control can do when high priority is given to a project and cost is no object. Our poorer subways, comparatively, are not an indictment of the free enterprise system. We do not want anything as ornate as the Russian Metros. We do, however, penalize ourselves in the eyes of the world when we endeavor to impose partial socialism on the normally smooth working of the free enterprise system by control of fares and undue regulation and regimentation. There is today too much state control of industry in the United States. This form of creeping socialism is gradually stifling free enterprise.

Housing

A major problem in Russia is that of housing, and a vast housing program is in full swing. In the cities, whole sections are being razed and new apartments erected.

The photos credited "F. C. Crawford" are courtesy of another delegate to Federation Aeronautique Internationale, Mr. Frederick C. Crawford, Chairman of the Executive Committee of Thompson Ramo Wooldridge Inc.

The new housing is of several types. Twenty percent can be over five stories high, and these must have elevators. Such apartments are all on the main streets of the metropolitan centers. Those out of the "showcase" area are no more than five stories high and have no elevators.

Many of the large apartment building complexes are complete communities with stores. Each family has one or more rooms but, except in rare cases, two families share the bath and kitchen facilities. This doesn't sound very attractive to us, but it is heaven to the Russians; previously it was not uncommon for them to live one, two, and sometimes more families in one bedroom.

Farm Production

The greatest current Russian problem is the low productivity of their farms—by our standards. This is caused, in large part, by lack of mechanization and the consequent large amount of manual labor required.

On one collective farm we visited, there were about 500 families. It was run by a committee of nine, and the committee chairman was boss. Another committee of five checked on the manner in which the farm was run by the first committee.

Originally, after private ownership, almost all farms were collective. Today, about 60% are collective and 40% state-owned. The Com-

Although scarce and high-priced, consumer goods meet brisk demand, are quickly sold out.

Communists retain control with only 3% of population in party. Six million of 209,000,000 are members.

Sovfoto

at in another ten years
he most contented people in the world."

munists do not like the collective farms; it is their ambition to convert all agriculture to state ownership as quickly as possible, entirely eliminating the collective farm.

On the state farms, nothing is owned by the individual. The state furnishes land, housing, barns, equipment, and stock.

Consumer Goods

Consumer goods are scarce and high-priced. Yet, despite the high prices, commodities are quickly sold out when they become available.

Clothing appears serviceable but of generally poor quality in both material and workmanship. Even so, it is costly by our standards.

Radios, previously in short supply, are now in over-supply. This is partly because television has come in and most people want it (many feel they cannot afford both), and partly because of the difficulties inherent in following the market trend in a controlled, inflexible system.

People

The condition of the Russian people is improving. They have been told that in another ten years they will be the most contented people in the world.

A large sign on the road between Yalta and Simferopol depicts the Russian concept of the growth of Communism and the decline of Capitalism. It says: "By 1965 the Communist Bloc will account for more than half of the total world production." In other words, Russia, her satellites, and Red China expect by 1965 to produce more than all the rest of the world put together. The main race is obviously between the United States and Russia, with Red China increasing in importance with her developing industrialization.

Everyone—men, women, and children—is working and working hard. There is an attitude of dedication and determination, and everyone, especially in Moscow and Leningrad, seems to be hurrying.

Frankly, the people didn't appear happy, except in Georgia. This was probably the result, in large part, of the lack of consumer goods, but the iron control and regimentation probably had something to do with it. However, any thought that the people of Russia will rebel against Communism in the foreseeable future is unrealistic. This is because of the control, the indoctrination, and the fact that living conditions actually are gradually improving.

System

Russia exemplifies the control of many by a well-organized few. Of 209,000,000 people, only about six million are Communist Party members—just under 3%. The six million, however, run everything and dominate the country.

"Russia has a clear-cut, a definite objective: world Communization and domination."

The monolithic, centralized system is not efficient, despite the fact that decisions can be made very quickly at the top. As a matter of fact, it is so highly centralized that it is difficult to get quick action at the lower levels. This doesn't develop initiative; it causes much delay and confusion. Accomplishments are made in spite of, and not because of, the system. It is, in general, very unwieldy.

The most interesting thing we heard in Tbilisi was a statement by the prime minister that Georgia is now largely autonomous. If this is true, Russia may be starting geographic decentralization as a partial solution to its problem of over-centralization.

There have been many changes in Russian Communism since the 1917 revolution. They still say, "to everyone according to his need; from everyone according to his ability." But they no longer practice what they preach.

Civilian control is absolute. But to get the most out of even a regimented people, the people must have something to hope for. The new Russian rulers, realizing this, adopted the double-incentive system. High rewards are paid for excellence: for poor work there is severe punishment—even death or Siberia.

In Tzarism and feudalism, gravely disproportionate reward was given to a few, and many lived in misery. Our own capitalistic system was once very unfair. In our own country, abuse of capitalism caused change, which came through evolution and proper process of law. Actually, the pendulum has swung too far and we have new abuses of our system, good as it is, which must be corrected—but corrected by legal processes.

Once many worked hard—too hard—and a few profited, unfairly, from their efforts. Today a relatively few top people, in government and out, work very hard, and the many, taking it easier, profit from their efforts, their genius, and their sacrifices. This hard-working few, because of fatigue and often frustration and disappointment, have a disproportionate share of premature heart failures and nervous breakdowns. A more equitable distribution of effort is necessary. We must produce more, work harder as a nation, if we want our system to survive. The alternative, unless Russia slows down, is that Communism will prevail.

It is interesting that Communism has again lead to despotism in Russia. The principal difference is that there is a new group of tyrants. Until people change for the better, no political system will improve their inherent traits. This is particularly true in the case of a system—an ideology, the Communist philosophy—which denies the spirituality of man and, therefore, retards his moral improvement.

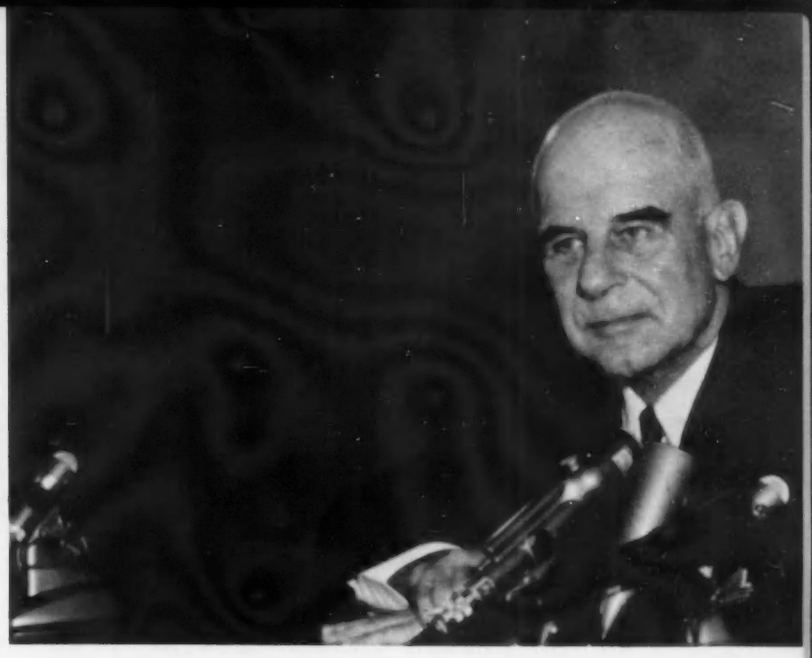
Russia has a clear-cut, a definite objective: world Communization and domination. She has a long-range, consistent, but flexible plan for the achievement of this objective. She lives wholly by the law of expediency: the end justifies the means. Murder, theft, subversion, lies, and dishonesty of every type are good, in the Communist mind, if they advance Communism.

Sometimes it seems that Russia is coming nearer to our viewpoint—adopting the incentive system—and we are closer to Russia's—becoming more and more socialistic. It is, however, going to be very difficult to reconcile our basic differences with Russia so long as she continues to prosecute her program by the methods she uses—as long as she operates by the law of expediency and ignores the Golden Rule. We can only hope that, in time, Russia will adopt a less-objectionable objective and less-objectionable methods. In the meantime, we must develop and maintain a high level of military, economic, and moral strength.

Whether we like it or not, we are in an all-out ideological struggle with Russia. Russia considers it a life-or-death struggle. We in this country do not yet appreciate its full import. It has already led to keen scientific and technological competition. It will, at the very least, lead to intense economic competition. It may lead to war.

We, as a nation, must think clearly, understand thoroughly the seriousness of the world situation, and plot a steadfast course . . . must work harder and if necessary be willing to make sacrifices. The alternative is the loss of our precious heritage—our freedom.

Here are General Doolittle's answers to specific questions posed by THE DEFENSE QUARTERLY.



In reference to Soviet advances in the scientific and military fields, what specific achievements are of greatest concern to the United States?

It is my feeling that the foundation of Soviet advances in basic and military science is their educational system. (In their schools, from start to finish, there is better discipline and greater application.) The specific Soviet achievements of greatest concern to the United States are these: First I would put their nuclear advances; that is, the increase in yield per unit of weight and size from the weapons point of view, and their advances in controlled nuclear energy from the point of view of using it as a power source. Second are their electronic advances, as particularly represented in their excellent radar. Third, of course, are their advances in missiles and space—and there their outstanding advance has been in propulsion.

Currently, how does the Soviet rate of progress compare with ours?

I believe their rate of progress is greater in almost all of those things to which they are giving high priority. Our rate of progress is greater in missiles, to which we have given our highest priority.

How do you believe that our rate of progress will compare with that of the Soviets through the next ten years?

This, of course, is a very difficult question, and the answer will be determined by what we do and what they do over the next ten years. But I would say that, unless Russia slows down or we speed up, she will overtake us in all fields in which she is interested, with the possible exception of consumer goods, within the next ten years.

What do you feel we should do to reverse this trend?

We must become realistic. We've got to realize what Russia's objective is, and the success that she is experiencing in the achievement of that objective. To put it in the simplest number of words, we must increase our productivity; as a nation we've got to work harder. Russia is working harder than we are, and that is the principal reason she is making greater progress.

You state that the Soviet government pays high rewards for excellence. Could you illustrate this, please?

While I do not have the actual figures on this, I have been advised that the top-flight Soviet scientist—a member of the National Academy of Sciences—gets about 50 times more than a day laborer.

Is there a difference in approach between the U.S. and the USSR in encouraging worker productivity?

We all know the purposes, the good work, and the abuses of the American labor union. While the Russian union operates in one respect in the same way, in another respect it is exactly the opposite of our union. The Russian union, as does our union, looks out for the interests of the workers. In this respect, the union operates the same way in Russia as it does here. However, the great difference between the Russian union and ours is that, in Russia, the union—which of course is government-controlled—encourages the worker to work harder—to produce more.

You say that we in this country are tending to become more and more socialistic. Would you care to amplify?

I believe in the smallest amount of government necessary to accomplish the purposes of government. I believe that our government has become too large. I believe in a minimum of government control. I believe that the government should operate—and let's qualify the word "operate" to mean to actually compete in operation with other institutions such as industries—only where industry and the individual are unwilling or unable to operate. On the other hand, there are certainly some governmental operating agencies that are necessary because the work they do is either too big, or too complex, or too uninteresting to be done by any individual or agency or industry outside of government.

John T. Hayward, the youngest Vice Admiral the Navy has ever had, brings an unusual combination of characteristics to his job as Naval head of Development. In addition to a brilliant combat record, he commands an unusually large store of technical information about Naval weaponry.

A 1930 graduate of the Naval Academy, Admiral Hayward has more than 12,000 hours of flying time, and has served in many engineering and development posts. One of his most unusual achievements—earning a Distinguished Flying Cross (one of the four he holds) from the U. S. Army.

THE NAVY of 1960-1970

by Vice Admiral John T. Hayward, Deputy Chief of Naval Operations for Development, U.S. Navy

The future—since time began man has been trying to look into the future. He has made long treacherous voyages to the Oracle of Delphi, he has slaughtered animals to read the entrails and he has projected his thoughts into outer space looking to the stars for a solution. Today, as in the past, the future is the most intriguing subject of conversation. The only thing that has changed is the oracle. Of course, something else has changed, and that is the magnitude of the portent before the questions were what of my future? What of the outcome of the battle? Today, we ask what of mankind's future and that of civilization?

Certainly we can attempt to predict by statistical analyses, by trends, by intelligence—but these are no more definite than the medicine man who may have had similar inside information. So basically we are still confronted by the age old problem—the future, "whither goest thou?".

The 1970 Navy will have a new significance as an outstanding strategic and tactical force capable of covering over three-fourths of the globe while fulfilling all the exacting demands of war—mobility, endurance, surprise, and a very high degree of immunity.

Long-range Navy Objectives

The Navy of the 1970 era is defined to a large extent by its ten-year shipbuilding, aircraft, and missile programs, based on long-range objectives for the Navy's weapons and forces. Recognizing that technology and changes in enemy posture and threat will require revisions not now foreseeable, these objectives and programs are under continuing review. Since these objectives are based on principles and basic situations which change slowly, the Navy believes that, in its broad elements, the present picture of the future Navy will remain solid and one toward which we can safely build.

By maintaining a vigorous, healthy research and development program, the Navy does its best to forecast and take advantage of changing technology. This effort allows us to be guided by the nation's best scientific and technical talent and permits us to fully utilize the country's Yankee ingenuity and industrial "know-how." The posture of the future Navy is adapted to two basic concepts: first, in order

to deter an all-out nuclear war the United States must have a secure nuclear retaliatory force. Second, assuming this retaliatory force does deter an all-out nuclear war, the threat of limited aggression becomes greater. Therefore, we must be able to defeat limited aggression on whatever scale the Soviet Bloc is able to wage it, and that is now a very large scale.

These two basic concepts lead to the requirement for military forces with the widest range of flexibility. Naval forces of the future, like those of the past, will be designed to cover a broad spectrum of exigencies. Naval activity will range from effective display of force, at one extreme, to assistance for peoples beset by national catastrophies, at the other.

We plan by 1970 to have reached an adequate number of Polaris ballistic missile launching submarines to provide a portion of the overall retaliatory force necessary to deter all-out war. There is no intent to pad our objective in this field with more missile submarines, in fact we intend to resist inflating our retaliatory forces because of the urgency and magnitude of the limited war threat during this era.

A war of limited objectives will, by definition, be fought outside the Soviet Colonial Empire and the United States. To accomplish this we must exploit to the fullest the Navy's traditional role of exerting power across the ocean expanses. Thus we must be capable of controlling the critical sea lanes, of striking the objective area with discrimination and precision, and landing forces promptly and effectively.

The planned Navy of 1970 is designed to meet these needs. Forces for these purposes must be large because the enemy's forces are large, the area to be covered is great, and a war of limited objectives does not permit the use of large nuclear weapons to overcome a quantitative weakness.

Control of the Seas

Since the Navy's major mission is to maintain control of the seas so that our industrial and military strength may be projected to any part of the globe, our entire effort is focused on the accomplishment of this mission. The Navy realizes that today the greatest threat to the success of this mission is the large Soviet submarine force. Industrial leaders, as well as certain military men, have insisted that the Navy assign a Special Project status to anti-submarine warfare—a status similar to that now assigned to the Polaris program or even to that of the World War II Manhattan Project. These people fail to appreciate the fact that the

Wide World

"The principles of warfare remain fixed: it is only the methods that change."

Navy in its entirety is just such a project. It is true that we identify certain forces as primarily anti-submarine forces, but all forces—carrier striking force, amphibious force, mine force, as examples—contribute to anti-submarine warfare. The carriers will attack submarine bases to assist in the attrition of submarines at sea. The amphibious forces will secure forward bases for anti-submarine operations, and deny these bases to the enemy. The mine force will restrict enemy submarine activity by laying mine fields in strategic areas.

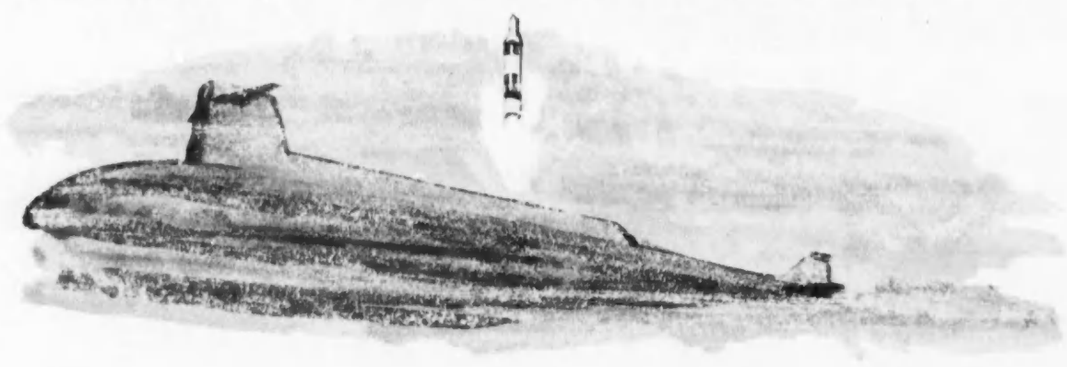
Our largest group of forces will be specifically designated for anti-submarine warfare. These will be charged with protecting the sea routes, with convoying shipping, with supporting forces in the objective area, and with direct offensive action against submarines in the open ocean. They will also lend a strong measure of protection against missile launching submarines. Of course, the main defense against such an attack must be our own invulnerable deterrent force, but no sound military man ever leaves an enemy an avenue of attack that is completely unprotected.

The Soviet Submarine Menace

Anti-submarine warfare units are the protection against the greatest menace to our naval superiority—the Soviet submarines. One might contend that the Soviets could not use their submarine fleet without provoking general war. This, however, need only be true if we desire to make it so, since such a force could be used as a blockade force to resist our carrying out a war of limited objectives. War with the Soviets then would be our decision, and it is likely we would attempt to prevent the war from becoming an all-out war.

Now, behind this defensive/offensive anti-submarine force, we would have our striking forces. Basically these are typified by the present Sixth and Seventh Fleets. They are independent self-sufficient fleets with all the ingredients necessary to concentrate a powerfully integrated force quickly in almost any place in the world. The backbone of this group is the fast carrier striking force consisting of modern carriers, guided missile cruisers, and guided missile frigates which provide the surface and air components necessary to obtain local superiority so that the Marine amphibious force may land by the new technique of vertical assault launched from helicopter carriers and streamlined for maximum striking power per unit of weight and volume. In support of this operation are the mine sweepers, a hunter-killer task group and the necessary auxiliaries to provide at sea replenishment for continuous operations. Since wars of limited objectives continue to be a major threat to world peace, we must continue to be ready to meet this threat in any place in the world. The only difference we envisage between the operations of 1970 and those of Lebanon is the modernization of ships and equipment to meet the ever-increasing threat of new enemy capabilities.

The principles of warfare remain fixed; it is only the methods or weapon systems that change. An as example, Genghis Khan provided a deterrent by destroying and killing a city of one million people—a destruction greater than either atomic bomb of World War II. Timely concentration was reemphasized in the Civil War by the famous saying "Git there fustest with the mostest." We in the Navy do not envisage new principles of warfare—only the modern ways of executing them.



The Pattern of the Future Army

by Lieutenant General Arthur G. Trudeau, Chief of Research and Development Department of the Army

Whether the next decade brings general war, limited war or continuing international tension, the Army, through a three-pronged program, plans to fill a vital mission in U.S. defense.

The future may be running away from us. We may find ourselves in the situation of an automobile speeding along an expressway at night. If we are not careful, we may outrun our headlights and lose control of our destiny. The increase in scientific and technological progress and the deepening threat of the Communist Bloc over the past 20 years have made our national requirements for the future a baffling mixture of economic, political, and military factors.

The military factor in this national equation is far more important than ever before, necessitating a closely integrated mutual effort among industry, government and armed forces. Future requirements for the armed forces will have an impact on every phase of our national life.

The Army is keenly aware of its expanding mission in the next decade to help provide for the security of the U.S. and the Free World. This mission includes overseas deployments to provide a strong deterrent force; air defense forces to protect industrial and military bases and our people from attack by aircraft or

Lieutenant General Arthur G. Trudeau has an impressive military record as engineer, troop commander and trainer. A 1924 graduate of the Military Academy, he was commissioned in the Corps of Engineers. No stranger to military innovation, General Trudeau was among the pioneers of modern amphibious warfare. At the request of MacArthur, he was ordered to the Pacific in 1942 planning for amphibious operations there.

Other World War II assignments included various special missions to Italy, North Africa and Great Britain as well as service as Director of Training for the Army Service Forces.

In post-war Germany, General Trudeau commanded the crack 1st Constabulary Brigade. Later he served as Deputy Commandant of the Army War College, and as Commander of the 1st Cavalry Division in Japan and the 7th Infantry Division during Korean hostilities.

"Change today is so rapid that we are buying early obsolescence in some

missiles; strategic reserve forces such as the Strategic Army Corps; and other reserves in manpower and materiel. These components of our defense posture are integrated with those of the other services such as the air-atomic retaliatory forces and those necessary to protect sea and air lanes to assure that our national policies can be executed successfully.

Research and Development Vital

A vital part of the Army's program to accomplish the national mission in the future is a Research and Development effort that will produce the weapon systems and materiel needed to assure a dynamic, vigorous reaction to any aggression. This program must consider the nature of the enemy threat for any time frame, the strategic and the tactical concepts developed to combat this threat, and the exponential rate of scientific and technological developments. Change today is so rapid that we are in effect buying early obsolescence in some military equipment. We can never allow ourselves to fall behind in the quest for new scientific discoveries and new methods of production or in the imagination and boldness needed to transform these factors into combat hardware.

A careful study reveals the dual nature of the predicted types of future conflict—atomic or non-atomic, general or limited. This places a tremendous burden on military planners and on the designers and builders of the machines of war to meet such a requirement.

The role of the soldier will increase in importance as the nation accepts added responsibility in thwarting Communist thrusts at vital economic areas and underdeveloped countries. Ground forces will need more mobility, both on the ground and in the air, and more reliable global communications such as promised by earth satellite relay systems. Weapons must be smaller, lighter, more potent. Logistical support must be more responsive and flexible to match the fluid battlefield. Man himself will have to be better trained to be able to exist in the severe environment of nuclear or chemical attack and to control the complex machines of war required to gain superiority over the enemy.

Many advances in weaponry are now in the final stages of development and testing. They are the result of applied research and development administered by the Army's seven technical services through the Office, Chief of Research and Development, Army General Staff. This billion dollar program is geared to keep the Army prepared against further Communist encroachment. About 3% is spent on basic research in 10 major fields and 74 subfields, conducted by 400 industrial, governmental and educational institutions. This work will be stressed because without it there would be little future development. Scientific progress today is the chief determinant of weapon evolution during the next decade or two. We must expand, not neglect, basic research; our national programs must reflect this fact.

Constant Alertness Required

In military R&D, the rapidity of inventions and breakthroughs requires a constant and studied alertness to use these developments. Information must be quickly assimilated and disseminated. The exchange of essential information by all agencies must be expedited. To take advantage of the rapid technological pace, concurrent research and production design is necessary—the "systems engineering" concept.

Improvement in governmental decision making in the evaluation and acceptance of new weaponry is particularly important. Lead time must be shortened in the face of monumental new requirements, such as:

New knowledge on the effect of extremes of temperatures and pressures in metallurgical research.

Foreign deployments play a key role in Army plans to deter aggression, control "brushfire" outbreaks. Wide World

ire in effect
me military equipment."

Completely new techniques to use new materials.

Tolerances never before required.

Design to meet unusual environmental conditions that may be encountered.

Simplified but advanced engineering and reduced time for retooling.

Development of items with unprecedented complexities and meeting the resulting man-machine compatibility problems.

All of these considerations have to meet the requirement for mass production within minimum production time!

As in commercial R&D, the Army needs to finalize design early to gain speed in production at the expense of absolute perfection. Perfection is a nebulous goal. Simplicity, ruggedness and reliability are essential. Improvement from 92% to 95% perfection or acceptability may easily double the time and cost involved without corresponding gain. Prototypes must also be produced in numbers sufficient to permit concurrent engineer and user testing; or, if the unit cost is excessive, combined testing should be carried on to save time, effect changes and expedite production engineering.

Tooling a Problem

Finally, in production, the crucial problem of production tooling contributes to extending our time scale. We need more capacity for rapid

Wide World

Wide World

Army considers defense of American cities against air attack basic to its mission during the coming decade.

"Government . . . procedures reflect perhaps the longest time lag in the cycle."

conversion of military production lines with modern tools already stockpiled or available from consumer production.

Industry's ability to mass-produce hardware has been a basic reason for our commercial greatness. This has been one great advantage over Russia and all other industrial complexes. We must continue to employ this "know-how" to the maximum. Industry and labor must improve procedures and utilize the full talents of all personnel. Government administrative and fiscal procedures reflect perhaps the largest time lag in the cycle. This has helped create an average weapon lead time of 8 to 10 years.

Our normal procedures are too restrictive. Deliveries can be speeded up only on a crash basis involving additional changes and retrofits, disruption of normal procurement procedures and possibly unacceptable delays. However, with some of our critical missile systems, planned telescoping of programs is now the rule because of recognition that there had to be some relaxation in regulations to meet the emergency caused by Sputnik I. In 14 missile projects, this has reduced average time from project initiation to operational availability to 5 years, 8 months.

Now let us look beyond the coming decade. Human nature may still turn man upon his brother as well as make him aspire to a better and fuller life. By 1975 there will be more than three billion people on earth. The international problems caused by such a population explosion are sure to have drastic effects. Our national policies will be strongly influenced and an alert defense posture will be even more necessary than today. In this framework, I feel that the Army must have a greater readiness and capability to engage in the small, local conflicts that it must be prepared to snuff out promptly. General war for this period is difficult to predict, since the technological pace of developments may well establish countermeasures and counterweapons to the atomic bombs and thermonuclear ballistic missiles of today.

Today's Breakthroughs Mean Future Weapons

Scientific breakthroughs today will be translated into weapons and equipment 10 to 20 years hence. For instance, the "thermoelectric" engine now in the laboratories may propel our ground and air vehicles with fuel consumption efficiencies that will reduce logistical requirements by one half, a startling change considering that fuels and lubricants composed two-thirds of all tonnage sent to Korea. By comparison, 15 years ago the atomic weapon was a laboratory device. Today it is integrated into the weapon arsenal for a host of delivery systems in a variety of yields.

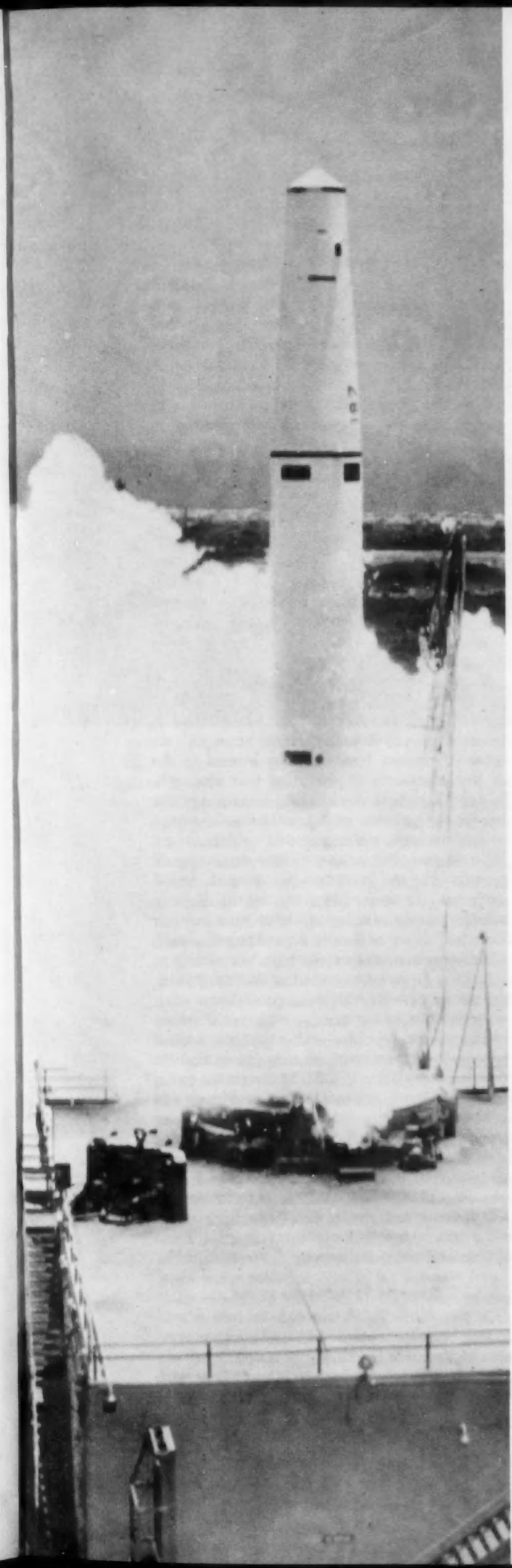
A further projection to the year 2000 is speculation. The science and technology of 1980 would give us a basis for a prediction but here again we are extrapolating a second time. One thing is certain, however, the second lieutenants and the industry trainees today have an enormous challenge before them if they are to become the generals and board chairmen of that time! I also think that added knowledge of the social sciences and of their fellow men will be even more important than it is today.

Our economic, political and military programs will be more closely intertwined in a world bursting with people, most of whom, strangely enough, will still be living the same sort of life that their ancestors experienced in the last hundred years—a sobering fact to those who would have us populating outer space or enjoying the one-day work week.

I mentioned earlier that we are accelerating into the future on the crest of scientific and technological achievements while other aspects of mankind's progress—such as the social sciences—are lagging. We must continuously strive to close this "gap" which may be more dangerous in the long run than the missile or military gap. This is a major challenge to all segments of our national economy and to the public to exploit the wonderful opportunities of the next decade—opportunities that can assure a higher standard of living here and abroad and a realistic approach to advancing Free World leadership.

The United States has as the foundation of its national and international power the greatest resources, both economic and human, in the world today. We must husband them carefully with integrated but dynamic economic, political and military programs shaped to a positive pursuit of national objectives.

This, in turn, must be matched by a national spirit and initiative to assure our continued ascendancy over the Communist aims of world domination.



Wide World

The Technical Explosion in Military Research and Development

by Lieutenant General Roscoe C. Wilson
Deputy Chief of Staff for Development, U.S. Air Force

What does the future hold for U.S. aerospace activities? The Pentagon's head of USAF research and development discusses the impact of growing technical knowledge on defensive and deterrent strategy.

Goethe, in his work "Elective Affinities," has Ferdinand comment:

> "It is most disagreeable that one cannot nowadays learn a thing once for all, and have done with it. Our forefathers could keep to what they were taught when they were young; but we have, every five years, to make revolutions with them, if we do not wish to drop altogether out of fashion."

The phenomenon of change has always been with us, but the rate of change has never been as great as it is today. Instead of revolutions every five years, we expect them to result daily from the technological explosion which the world is experiencing. Such change comes in large measure from our increasing search for knowledge and its applications to the complex problems of defense.

We are told that of all the humans ever born on earth, one twentieth are living today. The exponential curve of population increase is

"We are now in the process of transition to a mixed force of manned and unmanned vehicles."

very similar to the curve of increase in technological knowledge. The ever increasing rate of change in technology must therefore in part be attributed also to more and more people seeking new knowledge, and to the ever increasing competition in every field, brought about by sheer numbers.

Lieutenant General Roscoe C. Wilson's Air Force career has included a variety of assignments as pilot, engineer, and educator. After graduation from West Point in 1928, General Wilson took flying training and was assigned to the First Observation Squadron. Later assignments included Air Corps Engineering School, Aircraft Laboratory of the Experimental Engineering Section, and AAF project officer in support of the Manhattan Engineering Division.

General Wilson has also served as philosophy instructor at West Point, and as Commandant of the Air War College, Maxwell AFB, Ala.

His broad range of military assignments reflect, to a considerable degree, General Wilson's varied personal interests. He is an avid noon-hour reader of history and philosophy, a frequent lay speaker in the Episcopal Church, and a painter in water colors and oils. His interest in and assistance to the National Geographic Society has resulted in the naming of Wilson Field, Brazil, and Wilson Glacier, Antarctica, in his honor.

A Modest Ability to Forecast

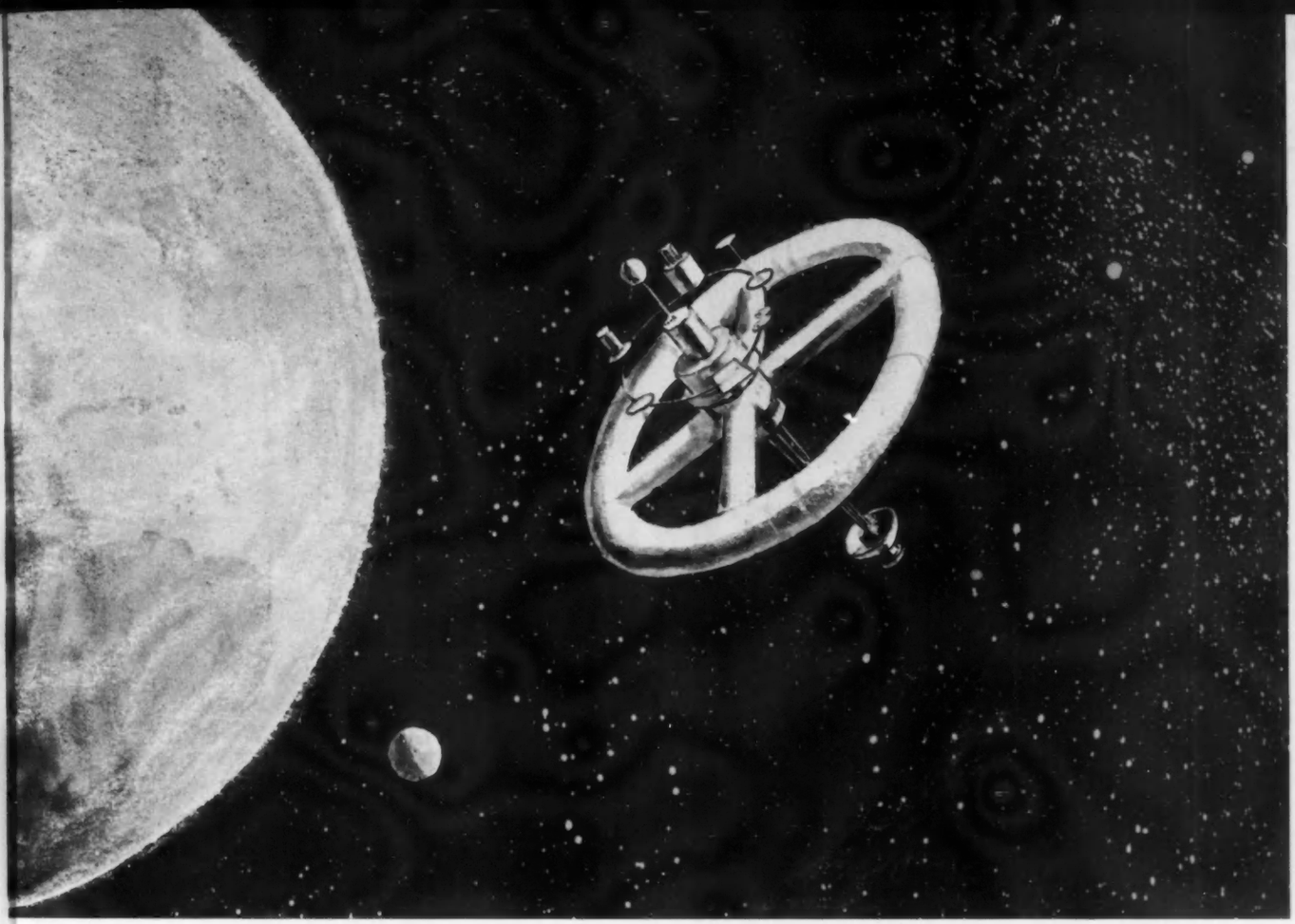
While it is difficult to anticipate the time and the way in which science will produce significant advances in knowledge, we already know the broad avenues in which we must apply such new knowledge. This gives us some modest ability to forecast the broad outlines of the future. Furthermore, our past success in forecasting gives us confidence in foreseeing the future. For example, in 1945, the report of the Von Karman Committee to the late General Hap Arnold, outlined the major areas in which significant advances would be made in weapons. Also when the development of ballistic missiles was given the highest national priority, the Air Force was able to lay down a schedule for development which has proven remarkably accurate. This is especially true in the case of the Thor, which was ready for deployment some 33 months after the initial blueprints were drawn.

Equally important, we can foresee that in the midst of change we will maintain several important constants. The first is our national determination to defend, through strength, our values of human freedom. The second is the Air Force mission in providing that strength. To carry out that unchanging mission we are now in the process of transition to a mixed force of manned and unmanned vehicles.

We are pressing scientists and engineers to produce weapon systems in several broad categories. To deter war, we are developing ballistic missile weapon systems so that our forces will have advanced characteristics such as fast reaction, extremely high performance, ability to penetrate, and destructive power. Maximum benefit will be derived from such weapons if our technology can make them simpler, more reliable, and more economical than their predecessors. In this connection we anticipate that the ICBM Minuteman, using solid propellants, will meet all these criteria and thus be a major addition to our military strength. Furthermore we should not limit our foresight to weapons which are in development, but must look beyond them, even in the missile field. Recent significant advances in miniaturization, materials, fuels, and propulsion could well result in missiles which are smaller, more reliable and cheaper than the Minuteman.

Manned Systems Required

On the other hand, we can foresee a continuing requirement for manned weapon systems so that our forces will possess the advantages of human judgment, ability to cope with the unknown, and the ability to respond to



changes in courses of action. Manned aircraft will provide our national military power with the flexibility of coping with a wide variety of contingencies. However, we can anticipate a decreasing number of such weapon systems, due primarily to their greatly improved performance and to the ever mounting costs of manned systems.

Before the next ten years have elapsed, the Air Force will be exercising a significant capability in aerospace. Ballistic missiles themselves are space vehicles. Our manned systems will be platforms for advanced missiles, notably the air-launched ballistic missile. Satellite systems with a wide variety of special uses, such as detection of ballistic missile attack, communications, navigation, and reconnaissance, will be an integral part of our day-to-day operations. The term "mixed" will be used in connection with our aerospace force in two senses. That force will be composed of a mixture of manned and unmanned systems, and such systems will be employed within the atmosphere and outside the atmosphere, forming a truly aerospace power for peace.

In summary, we can foresee the warfare systems which we must bring into being in the next ten years. The major problem lies in choosing the specific weapons we must develop. The richness of our technology makes such choices complex.

The Promise of the Future

The promise of the future has never been more stimulating than it is today. The technological revolution of today is traced directly to the revolution in physics of a generation ago so well described by Einstein, Bohr, and de Broglie. An intellectual breakthrough and revolution of this type can occur at any time and can transform the world of the next generation even more than the change we are experiencing today. New theories, new postulates, new assumptions may give us new applications in the fields of propulsion, anti-gravity devices, and materials.

When applied to the problems of insuring peace through strength, such a breakthrough will provide us with the technical means of finding new capabilities in aerospace power.

The partnership of industrial leaders, scientists, and military men will continue to be the key to our security. Military needs, as satisfied by the scientist, can be best brought to fruition through our free enterprise system. Integration of effort of the three partners now will give us the technological changes we will need in the next ten years and beyond. Just as the factories of our free enterprise system gave us the masses of equipment we needed in past wars, so will our laboratories and research institutes provide us with the quality weapons we need for aerospace power.

An outstanding news analyst and editor predicts the nation's reaction to the opportunities, the challenges, and the hazards of the coming decade.

AMERICA'S NEXT

by Malcolm Muir, Sr., Editor-in-Chief,
NEWSWEEK *Magazine*

Barring atomic war or some other unforeseen and unforeseeable cataclysm, the next ten years can be a period of economic growth without precedent—or anything approaching precedent—in the history of the world. Here in the United States we can achieve a standard of life, not just for the few but for the many, hitherto undreamed of.

If we achieve this new abundance, the rest of the Western world will not be far behind us. Europe is on its way. The Soviet Union may well outstrip us in rate of growth but it probably starts too far behind to catch up with us in a single decade. The underdeveloped countries of Asia and Africa are taking their first faltering steps toward modernization. But the process will be hurried for them by our help and example and even by the Soviet Union's determination to challenge us for the allegiance of these so-far uncommitted nations by offering a rival program of aid.

An Exciting Decade

It will be an exciting decade, rich in opportunity for the United States and its citizens, but fraught with hazards, too. The highest order of national leadership, supported by an educated and informed public opinion, will be required to make the most of the opportunities and to avoid the hazards. Whether we like it or not, we Americans have been cast in the role of Western leadership. We shall need all the wisdom, enterprise and forbearance we can muster to live up to our responsibilities. Our very well being, if we permit it to, can be our undoing.

One need only project present curves of population and production ten years forward to conjure up an almost dazzling picture of the United States in 1970. Various public and private organizations—the Commerce Department, the Census Bureau, the Committee for Economic Development, the National Planning Association, and the Rockefeller Brothers Fund, among them—have contributed to these speculations. While their findings are not identical in detail, they are remarkably similar in their basic assumptions. Together they provide as authoritative a forecast as one can hope for in an uncertain world.

Population the Key

An explosive growth in American population is the key to all their projections. By 1970, there will be 220,000,000 persons living in the United States—40,000,000 more than in 1960. These 40,000,000 will be additional customers for purveyors of all kinds of goods and services —housing, transportation, clothing, food, and recreation. They will increase the labor force, now 68,600,000, to 83,600,000. Satisfying their demands, the forecasters estimate, production and service enterprises will boost gross national product, now $480,000,000,000, to $800,000,000,000. Corporate profits before taxes will rise from $36,400,000,000 to $77,000,000,000. The average work week will decline from 40.5 hours to 37.5 hours, increasing enormously the total leisure time of almost all Americans. Total government spending, now $124,600,000,000, will increase to $205,000,000,000, assuming that the cold war gets neither very much colder nor very much warmer during the decade.

All of which adds up to riches—national and individual. Further exploitation of recent scientific advances in the areas of nuclear energy, automation, heat and radiation may make the nation even richer than these figures suggest. Space exploration doesn't seem to promise any commercial return in the foreseeable future, but who can say? Neither did the atomic bomb when it was first projected. No serious shortage of natural resources is likely to

T TEN YEARS

Fabian Bachrach

Malcolm Muir, Sr., has been a giant of American publishing for more than 30 years. A former president of McGraw-Hill Publishing Co. (where he founded the magazine BUSINESS WEEK), he joined the fledgling NEWSWEEK as president in 1937.

In addition to his publishing activity, Mr. Muir has been prominent in national economic affairs. In 1930 he served on President Hoover's Committee for Industrial Rehabilitation, and in 1933 he became one of four regional administrators of the National Recovery Administration. After the latter service, he was called "a human dynamo who . . . had a very broad grasp of industry as a whole."

Long a believer in seeing things for himself, Mr. Muir makes an annual trip through Europe, the Middle East and the Orient. He returned in August from a trip to the USSR, where he served on the President's Advisory Committee for the American Exhibition.

cloud the outlook within ten years if scarce minerals are extracted from lower grade ores and if domestic supplies are supplemented by imports.

The question, if the forecasters are right, is not so much how to acquire riches during the decade ahead as how to spend them. What priority are we to give the various claims on our national bankroll? It is in answering this question that we shall prove ourselves wise or foolish, wasteful or prudent. However rich, neither nations nor individuals are ever rich enough to satisfy all their wants at one time. Our nation, as its prosperity increases, will find it necessary to make hard choices. Since we are a democracy, these choices will be made, in the last analysis, by the voters. To make wise choices, they will have to know what they are deciding. They will need dedicated leadership and accurate information as they have never needed them before.

Leadership Challange Accepted

Some of their choices already have been made. They have decided, for example, to accept the challenge to assume international leadership—to spend as much as necessary for military defense and to support America's allies with military and economic aid. They have rejected the counsels of those in public life who would isolate the United States behind its ocean barriers and let the rest of the Western world fend for itself. How much it will cost in the years ahead to stand by this decision no one can know at this juncture. The chances are that it will cost more before it costs less. Most experts figure that present defense outlays of about $40,000,000,000 will rise to $55,000,000,000 by 1970, primarily because of the high cost of missilry. That is one item of expense Americans will not begrudge unless international tensions are relaxed more and faster than now seems likely despite President Eisenhower's laudable efforts to thaw out relations with the Soviet Union.

The electorate also seems to have decided that big government—and highly centralized government—are necessary in these times of shrinking distances and expanding social problems. The nation will continue to minister to the welfare of its less fortunate citizens through such devices as Old Age and Survivors Insurance and Unemployment Insurance. There almost certainly will be no turning back from this commitment. Indeed, the welfare-state aspects of our system probably will be expanded in the years ahead. Pressure for expansion will come from the army of citizens 65 years old and older, which will grow from its present size of 15,000,000 to some 21,800,000 by 1970, thanks to constant advances in medical science. The nation will be able to afford this unless the senior citizens become so effective a pressure group that they put over some grandiose scheme like the Townsend Plan of depression times.

Some Decisions Not Yet Made

But in some highly important areas of public policy final decisions have not yet been made. Take urban renewal, slum clearance and public housing, for example. Most American cities are obsolescent. In New York City the traffic problem seems almost insoluble unless the city is virtually rebuilt. City and rural slums both need to be pulled down and their inhabitants re-housed. A Federal highway system, already

started, will be inadequate before it is completed at the present rate of increase in necessary and recreational travel. The Federal government is now making an annual contribution of $1,000,000,000 a year to various housing activities, including urban renewal, and it contributed substantially to the total of $8,300,000,000 spent on the nation's roads in 1958. Experts anticipate that the total bill for necessary road construction and maintenance will come to about $13,000,000,000 in 1970 with the Federal government contributing something over $4,000,000,000, raised principally by increased gasoline taxes.

Education also will make urgent demands on the Federal government in the next few years. These demands will gain force both from an amazing over-all increase in school-age population and from a mass movement of parents to new suburban communities where school construction must start from scratch. The increase in elementary school-age youngsters (5 to 13) will amount to about 1,000,000 a year for the next ten years. College-age youths (18 to 21) will number 14,600,000 in 1970, twice their 1957 total. Because a highly complex industrial society like ours must be assured a constant supply of trained personnel if it is to survive, the Federal government will help provide schools and teachers if local governments fail to do so. Our rival, the Soviets, seem to be outmatching us in some departments of education even now.

Claims on the New Prosperity

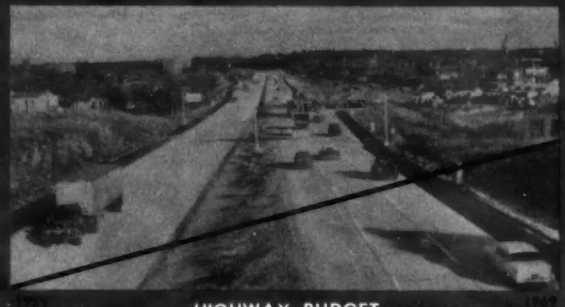
So social security, slum clearance, highway construction, schools and colleges will all present valid claims on the new prosperity. But if they are all satisfied what about the individual? What will be left for the entrepreneur, the enterpriser, the manager and the worker if all the desirable social and community services are provided for? America's dynamism derives from the sum of the contributions of all its citizens making their own choices, spending their own net earnings as they see fit and working primarily for the betterment of themselves and their families. If society demands too much of them in the form of taxes or social restraints their initiative will be impaired and the whole national community will suffer. The question is where the point of diminishing return sets in. In wartime, as they have often proved, Americans will gladly give everything they have, including their lives, for the common cause. In peacetime, they think of themselves first and the community second. Even so, the community shares their concern and commands willing sacrifices if its demands are reasonable.

The melon of prosperity, if it ripens as it should in the next decade, will be big enough, properly sliced, to satisfy the requirements both of the community and the individual. The forecasters estimate that personal expenditures will have gone over the $500,000,000,000 mark by 1970—a figure greater than the whole gross national product now. This would bring disposable income per household up to an almost incredible $9000 as compared with the present $6100. The average factory worker, assuming moderate but not runaway wage increases, would be able to afford 35 percent more goods and services than he can now. He would have more leisure to spend in his car, aboard his boat or at his other hobbies. Assuming that gross national product outstrips government costs, taxes would take no more, and perhaps less, of his income than they do now. Even on shorter hours, because of automation, he would produce some 40 percent more than he does now.

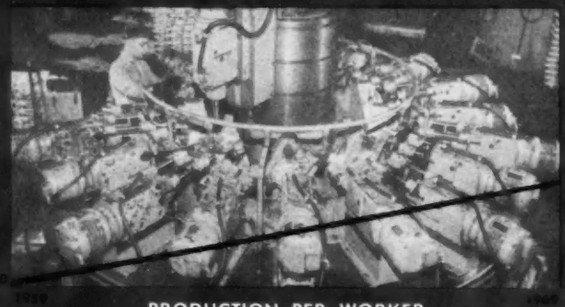
A Bright Future

It is indeed a rosy picture the forecasters

LABOR FORCE



HIGHWAY BUDGET



PRODUCTION PER WORKER

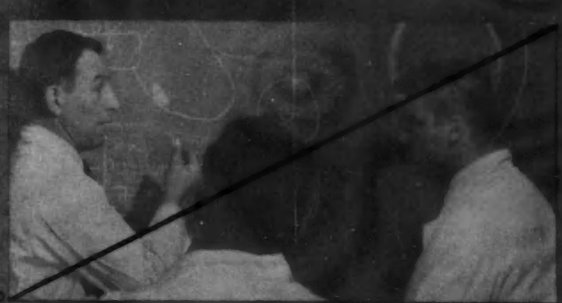
S OF FUTURE PROSPERITY

GROSS NATIONAL PRODUCT

TOTAL GOVERNMENT BUDGET

DEFENSE BUDGET

POPULATION OVER 65



COLLEGE AGE POPULATION

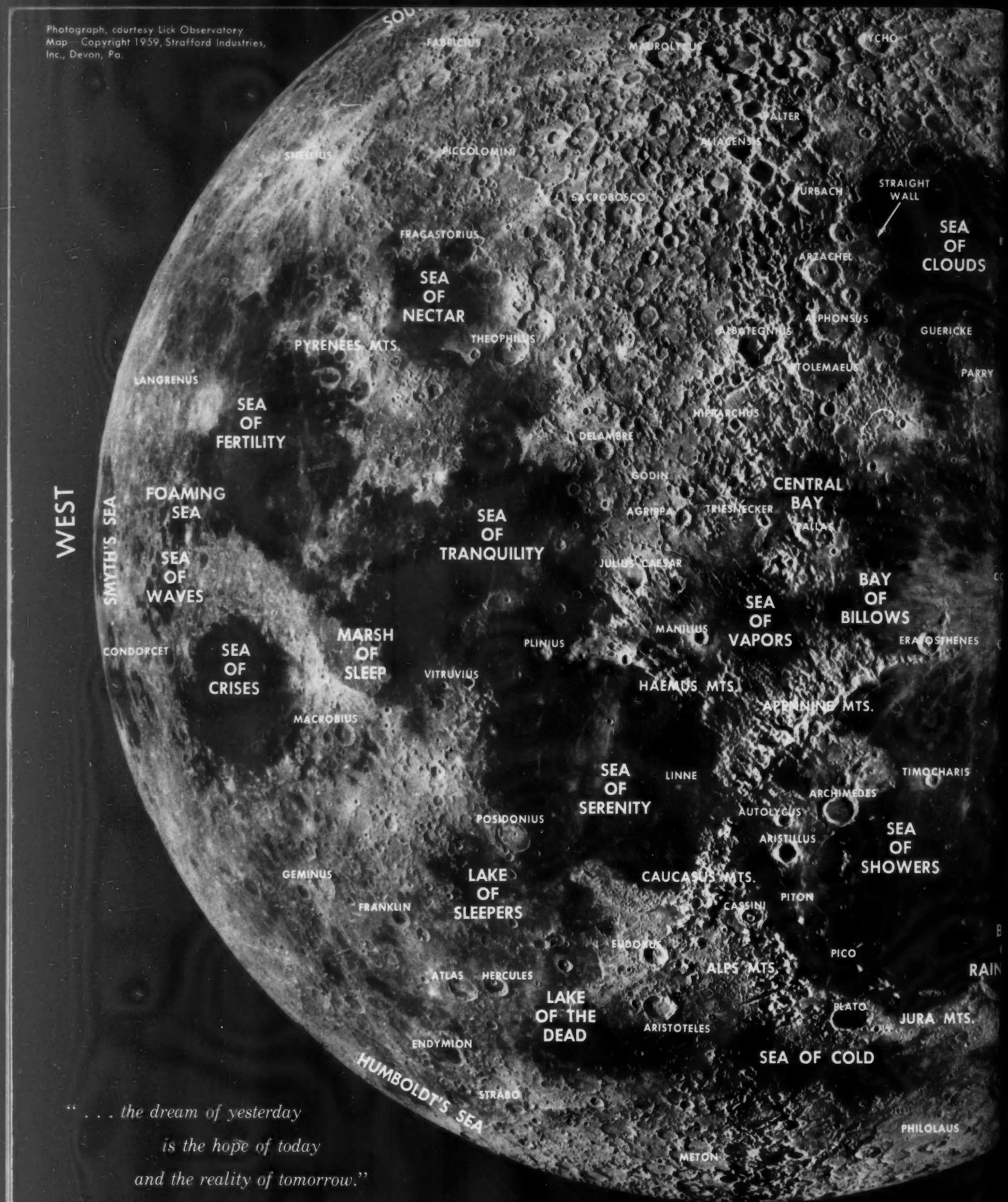
LENGTH OF AVERAGE WORK WEEK

Wide World Photos

paint. Yet the painters are hard-headed businessmen, sober economists and solid academicians, not starry-eyed dreamers. The future they project is not unattainable. The political atmosphere at the moment is favorable to the kind of growth they foresee. Both major parties are espousing moderate policies and are led by moderates. There is a sort of national consensus on the most important policy questions. Areas of agreement between the parties are larger than the areas of disagreement. The President has been remarkably successful in arousing Congress and the country to the dangers of inflation. Congress has made a start toward containment of the danger to the public interest represented by the Jimmy Hoffas of organized labor. In international affairs, we have held the Western alliance together in the face of the threat to Berlin and we seem to be gaining in the armament race.

If we as a nation fail to come up to 1970 stronger, more prosperous and more secure than we are now, we shall have only ourselves to blame. And we can fail for any one of a variety of reasons. We can permit prosperity to make us flabby; out of eagerness for world peace we can misjudge the Soviet Union's real intentions; discouraged by the difficulties of holding the Western alliance together, we can decide to go it alone after all; we can easily fall into the habit of letting the Federal government assume too many responsibilities or, on the other hand, we can, out of disillusionment with big government, swing too far in the direction of laissez faire.

The greatest hazard of all, I believe, is public indifference and ignorance—a feeling that our problems are so complicated and difficult that the average citizen can't hope to understand them and might as well spare himself the effort of trying. When this happens, an ignorant electorate will choose our public officials. It must be the primary concern of all of us who work in the field of communications to see that this doesn't happen.

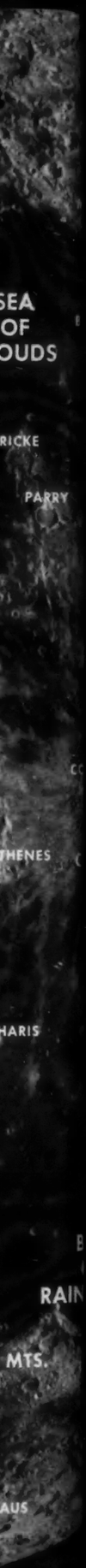


" . . . the dream of yesterday
is the hope of today
and the reality of tomorrow."

ROBERT GODDARD

Copies of the complete Lunar Landscape (35x48 inches) are available on request. Write to Dept. 695, General Electric Co., Schenectady 5, New York.

GEO-151-4
10-59 (18.5M)


SEA
OF
OUDS
RICKE
PARRY
THENES
HARIS
RAI
MTS.
AUS